MOTRON

SERVICE MANUAL

VENTURA 125

GROUP INDEX

1.GENERAL INFORMATION/TROUBLE DIAGNOSIS

CONTENTS

SYMBOLS AND MARKS

Symbols and marks are used in this manual to indicate what and where the special service are needed, in case supplemental information is procedures needed for these symbols and marks, explanations will be added to the text instead of using the symbols or marks.

Warning	Means that serious injury or even death may result if procedures are not followed.
Caution	Means that equipment damages may result if procedures are not followed.
Engine oil	Limits to use SL15W-40 API SH/CD class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil.
Gear oil	Limits to use SGL-4 85W-90 class oil. Warranty will not cover the damage that caused by not apply with the limited gear oil.
Grease	King Mate G-3 is recommended.
Locking sealant	Apply sealant, medium strength sealant should be used unless otherwise specified.
Oil seal	Apply with lubricant.
Renew	Replace with a new part before installation.
Brake fluid	Use recommended brake fluid DOT4 or WELLRUN brake fluid.
Special tools	Special service tools.
Correct	Meaning correct installation.
Wrong	Meaning wrong installation.
Indication	Indication of components.
Directions	Indicates position and operation directions.
	Components assembly directions each other.
	Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).

GENERAL SAFETY

Carbon monoxide

If you must run your engine, ensure the place is well ventilated. Never run your engine in a closed area. Run your engine in an open area, if you have to run your engine in a closed area, be sure to use an extractor.

⚠Caution

Exhaust contains toxic gas which may cause one to lose consciousness and even result in death.

Gasoline

Gasoline is a low ignition point and explosive material. Work in a well-ventilated place, no flame or spark should be allowed in the work place or where gasoline is being stored.

⚠Caution

Gasoline is highly flammable, and may explode under some conditions, keep it away from children.

Used engine oil

⚠Caution

Prolonged contact with used engine oil (or transmission oil) may cause skin cancer although it might not be verdict.

Hot components

⚠Caution

Components of the engine and exhaust system can become extremely hot after engine running. They remain very hot even after the engine has been stopped for some time. When performing service work on these parts, wear insulated gloves and wait until cooling off.

Battery

- Battery emits explosive gases; flame is strictly prohibited. Keep the place well ventilated when charging the battery.
- Battery contains sulfuric acid (electrolyte) which can cause serious burns so be careful do not be spray on your eyes or skin. If you get battery acid on your skin, flush it off immediately with water. If you get battery acid in your eyes, flush it off immediately with water, then go to hospital to see an ophthalmologist.
- If you swallow it by mistake, drink a lot of water or milk, and take some laxative such as castor oil or vegetable oil, and then go to see a doctor.
- Keep electrolyte beyond reach of children.

Brake shoe

Do not use an compressed air or a dry brush to clean components of the brake system, use a vacuum cleaner or the equivalent to avoid asbestos dust flying.

⚠Caution

Inhaling asbestos dust may cause disorders and cancer of the breathing system.

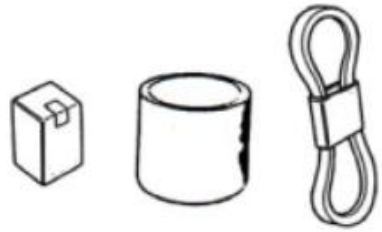
Brake fluid

⚠Caution

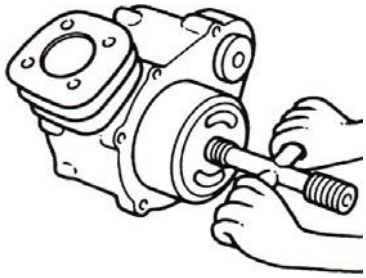
Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system.
Keep brake fluid beyond reach of children.

SERVICE PRECAUTIONS

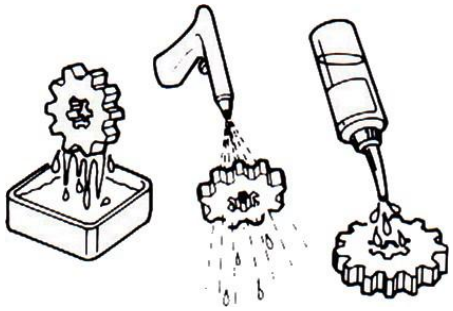
- Always use with genuine parts and recommended oils. Using non-designed parts for motorcycle may damage the motorcycle.



- Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.

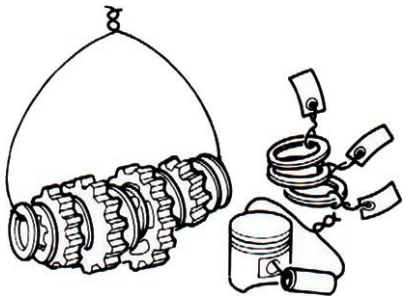


- When servicing this motorcycle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.
- Clean the outside of the parts or the cover before removing it from the motorcycle. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system to cause a damage.
- Wash and clean parts with high ignition point solvent, and blow dry with compressed air. Pay special attention to O-rings or oil seals because most cleaning agents have an adverse effect on them.

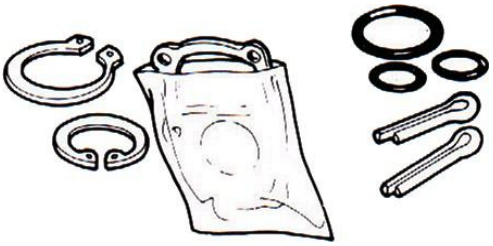


- Never bend or twist a control cable to prevent stiff control and premature worn out.

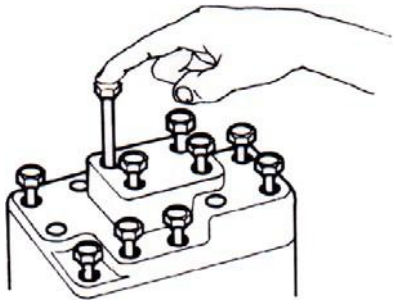
- Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.
- When loosening a component which has different sized fasteners, operate with a diagonal pattern and work from inside out. Loosen the small fasteners first. If the bigger ones are loosen first, small fasteners may receive too much stress.
- Store complex components such as transmission parts in the proper assemble order and tie them together with a wire for ease of installation later.



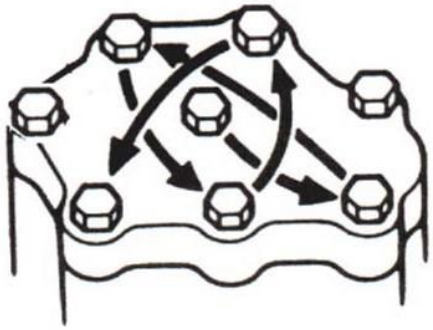
- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).
- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap rings, and split pins.



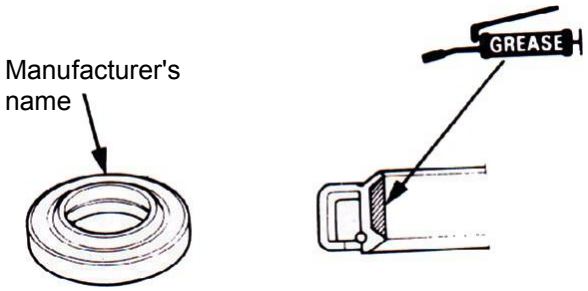
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.



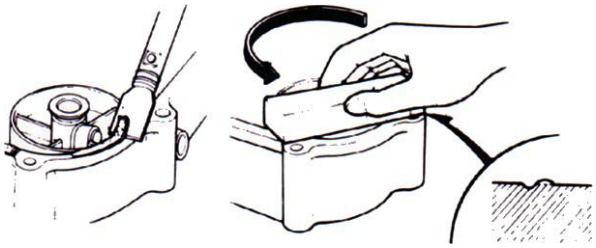
- Tighten assemblies with different dimension fasteners as follows:
- Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise indicated. Bolts and fasteners should be kept clean and dry. Do not apply oil to the threads.



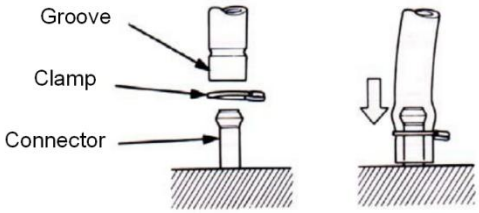
- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



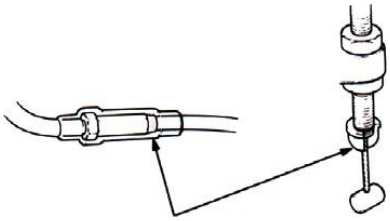
- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.



- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.

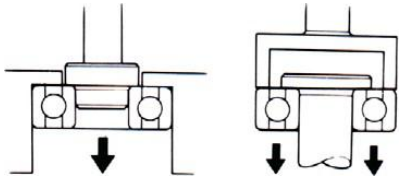


- Rubber and plastic boots should be properly reinstalled to the original correct positions as designed.



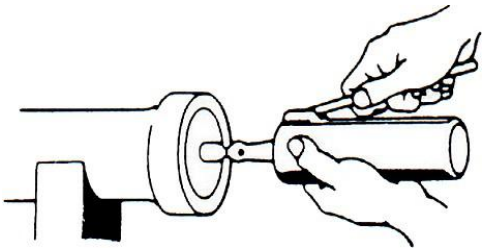
Boots

- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.

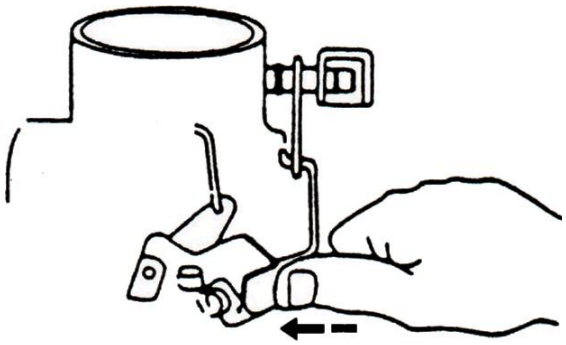


Both of these examples can result in bearing damage.

- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



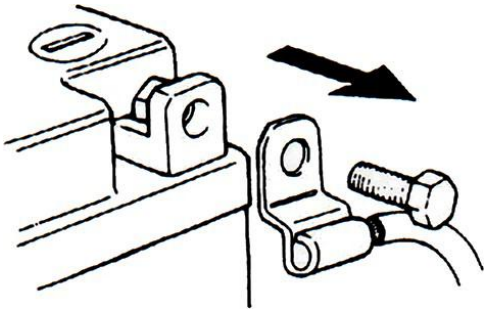
- Check if positions and operation for installed parts is in correct and properly.



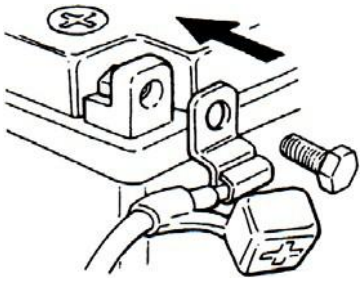
- Make sure service safety each other when conducting by two persons.

- Note that do not let parts fall down

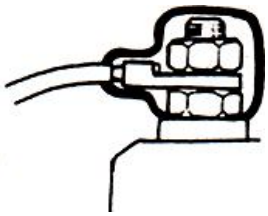
- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



- After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly. And the two posts of battery have to be greased after connected the cables.

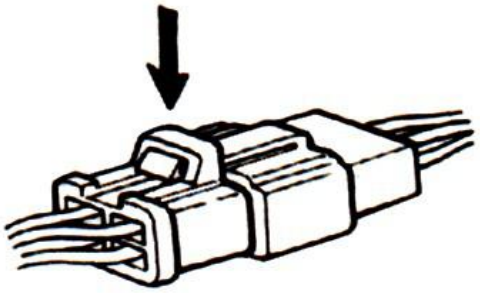


- Make sure that the battery post caps are located in properly after the battery posts had been serviced.

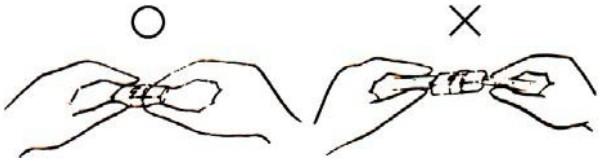


- If fuse burned, it has to find out the cause and solved it. And then replace with specified capacity fuse.

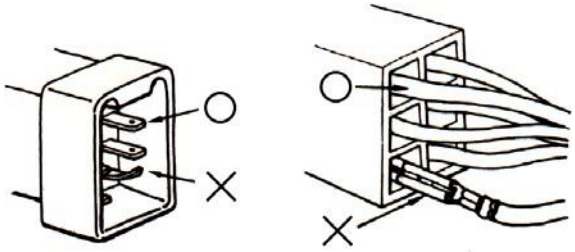
- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.



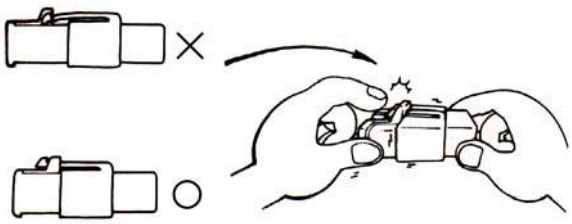
- Do not pull the wires as removing a connector or wires. Hold the connector body.



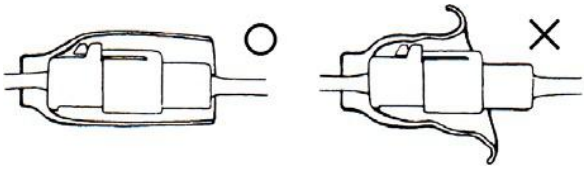
- Make sure if the connector pins are bent, extruded or loosen.



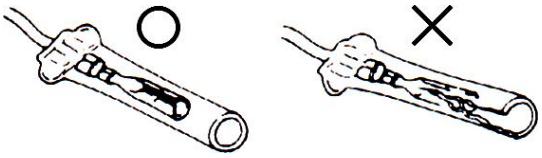
- Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.



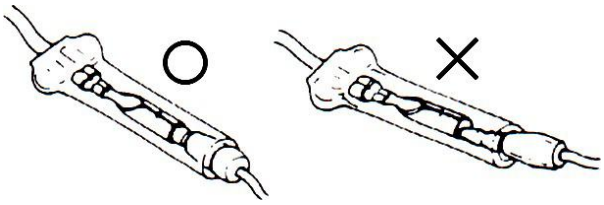
- Check if the connector is covered by the twin connector boot completely and secured properly.



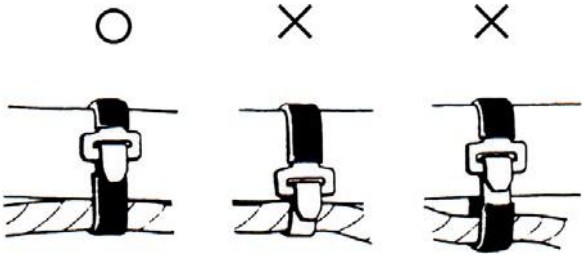
- Before terminal connection, check if the boot is crack or the terminal is loose.



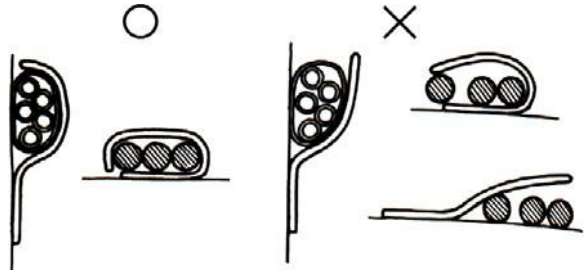
- Insert the terminal completely. Check if the terminal is covered by the boot. Do not let boot open facing up.



- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.

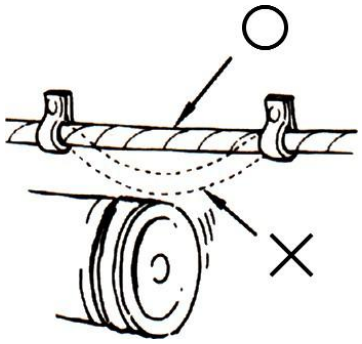


- Wire band and wire harness have to be clamped secured properly.

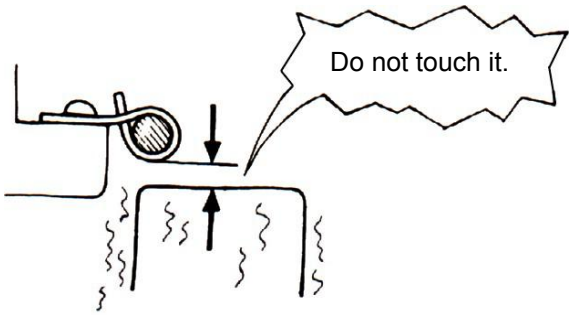


- Do not squeeze wires against the weld or its clamp.

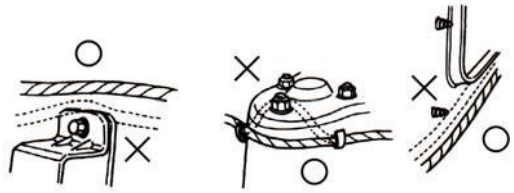
- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.



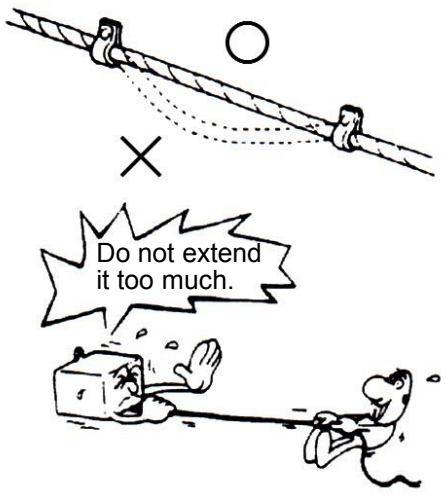
- Keep wire harnesses far away from the hot parts.



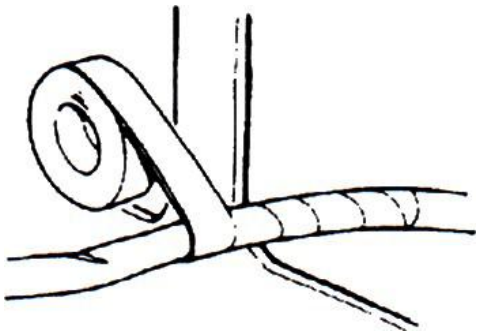
- Route wire harness to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.



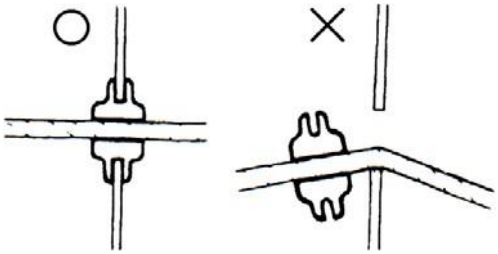
- Route harnesses so that they neither pull too tight nor have excessive slack.



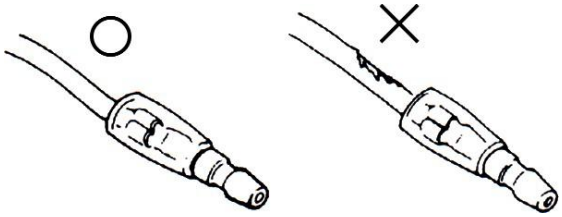
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



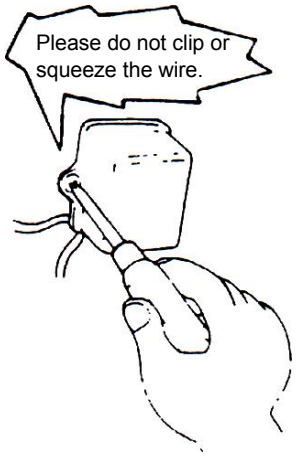
- Secure the rubber boot firmly as applying it on wire harness.



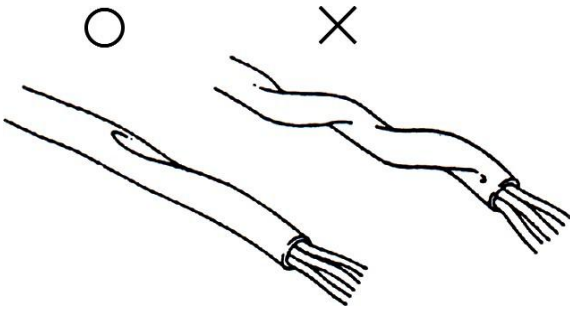
- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.



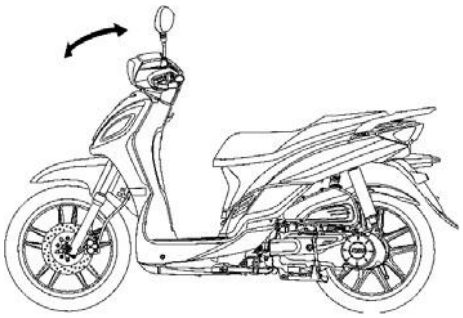
- Never clamp or squeeze the wire harness as installing other components.



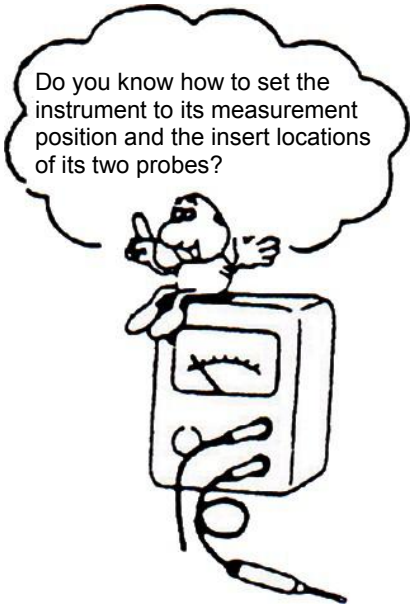
- Do not let the wire harness been twisted as installation.



- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions.



- Before operating a test instrument, operator should read the operation manual of the instrument. And then, conduct test in accordance with the instruction.



- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.

SPECIFICATIONS

Model / Item	Specification			
		Ventura 125	**Engine cod**	BN152QMI-D
Length		1980mm	**Front shock absorber**	Telescopic fork
Width		685mm	**Rear shock absorber**	Unit swing
Height		1150mm	**Clutch type**	Auto centrifugal clutch
Wheel base		1350 mm	**Transmission**	C.V.T.
Net Weight		120kg (Front:48kg Rear:72kg)	**Front tire**	110/70-16
Model		Single cylinder,4-stroke, forced air cooled engine	**Rear tire**	110/70-16
Fuel required		E5/E10	**Rim type**	J16 X MT2.50 （Aluminum）
Displacement		124.6 cm^3	**Tire pressure**	225kPa
Compression ratio		10.4±0.2 :1	**Front brake**	Disk type (Ø 260 mm)CBS
Maximum HP		7.2 kW/8000 rpm	**Rear brake**	Disk type (Ø 240 mm)
Maximum torque		8.8 N·m/6500 rpm	**Head lamp(high, low)**	12V LED
Valve clearance: IN/EX		inlet: 0.12mm, outlet: 0.12mm	**Front position lamp**	
Starting methods		electrical starter	**Front/ Rear direction indicator**	
Engine oil capacity		0.9 L (0.80L for change)	**Rear position lamp/Stop lamp**	
Transmission oil capacity		0.13L (0.11Lfor change)	**Licence light**	
Fuel tank capacity		7.0L±0.2 L	**Battery capacity**	12V 6Ah or 12V 7Ah
Fuse		15A×2	**Air cleaner**	Paper type
Spark plug		NGK CR7HSA		

TORQUE VALUES (ENGINE)

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
A.C. generator flange bolt	2	6	0.8~1.2	
L side cover plate pan screw	7	5	0.5~0.7	
RR. brake shoe anchor fixing nut	1	8	1.5~2.0	
Rear brake arm flange bolt	1	6	0.7~1.1	
Engine oil filter screen cover	1	30	1.0~2.0	
Crankcase bolts	2	6	0.8~1.2	
Oil pump flat screw	2	6	0.8~1.2	
Cylinder/cylinder head two-ends bolts	4	8	0.7~1.1	Tighten to crankcase
Cylinder head left side bolts	2	6	0.7~1.1	
Camshaft sprocket bolt	2	6	1.0~1.5	
Valve adjustment fixing nuts	2	5	0.7~1.1	Apply oil to thread
Camshaft chain tensioner pivot bolts	1	6	0.8~1.2	
Camshaft chain adjuster bolts	2	6	0.8~1.2	
A/I fixing flange bolt	4	6	0.8~1.2	
Oil pump separator bolt	2	6	0.8~1.2	
One-way clutch lock nut	1	22	9.0~10.0	Apply oil to thread
Right crankcase cover bolts	10	6	0.7~1.1	
Pulse generator bolts	2	5	0.4~0.6	
A.C. generator flange bolt	2	5	0.8~1.2	
Flywheel nut	1	12	5.0~6.0	
Cooling fan flange bolt	4	6	0.8~1.2	
Shroud A/B	2	6	0.7~1.1	
Engine oil draining plug bolt	1	12	3.5~4.5	
Start motor bolts	2	6	0.7~1.1	
Transmission bolts	7	8	2.6~3.0	
Gear oil draining plug	1	8	1.0~1.5	
Gear oil filling bolt	1	8	1.0~1.5	
Driven pulley nut	1	12	5.5~6.0	
Driving face nut	1	12	5.0~6.0	
Left crankcase cover bolts	8	6	0.8~1.2	
Cylinder head holder nuts	4	8	1.8~2.2	
Cylinder head cover bolts	4	6	0.8~1.2	
Spark plug	1	10	1.0~1.2	
Carburetor heat protector connecting nuts	2	6	0.7~1.1	
Exhaust pipe bolts	2	8	3.0~3.6	
Exhaust pipe connecting nuts	2	6	1.0~1.4	

TORQUE VALUES (FRAME)

ITEM	Q'TY	THREAD DIA (mm)	TORQUE VALUE(Kg-m)	REMARKS
Mounting Hex socket bolt for steering handlebar	4	10	4.0~5.0	
Mounting nut for steering rod	1	25.4	1.0~2.0	
Cone seat for steering rod	1	25.4	0.2~0.3	
Front wheel shaft nut	1	12	5.0~7.0	
Rear wheel shaft nut	1	16	11.0~13.0	
Wheel hub/rim mounting nuts	8	8	2.8~3.2	
Speedometer cable locking screw	1	5	0.15~0.3	
Front shock absorber mounting bolts	4	8	2.4~3.0	
Rear shock absorber upper connection bolt	1	10	3.5~4.5	
Rear shock absorber lower connection bolt	1	8	2.4~3.0	
Brake lever bolts	2	6	0.8~1.2	
Front brake hose bolts	2	10	3.3~3.7	
Front brake air-bleeding valve	1	6	0.8~1.0	
Front brake disc mounting bolts	4	10	4.0~4.5	
Front brake clipper mounting bolts	2	10	3.1~3.5	
Drum brake arm bolts (front/rear)	2	6	0.8~1.2	
Engine suspension bracket bolts	2	10	4.5~5.5	On frame side
Engine connection bolt	1	10	4.5~5.5	On engine side
Main standard nut	1	10	3.5~4.5	
Foot-starting lever bolt	1	6	1.6~1.8	
Air cleaner bolts	2	6	1.0~1.4	

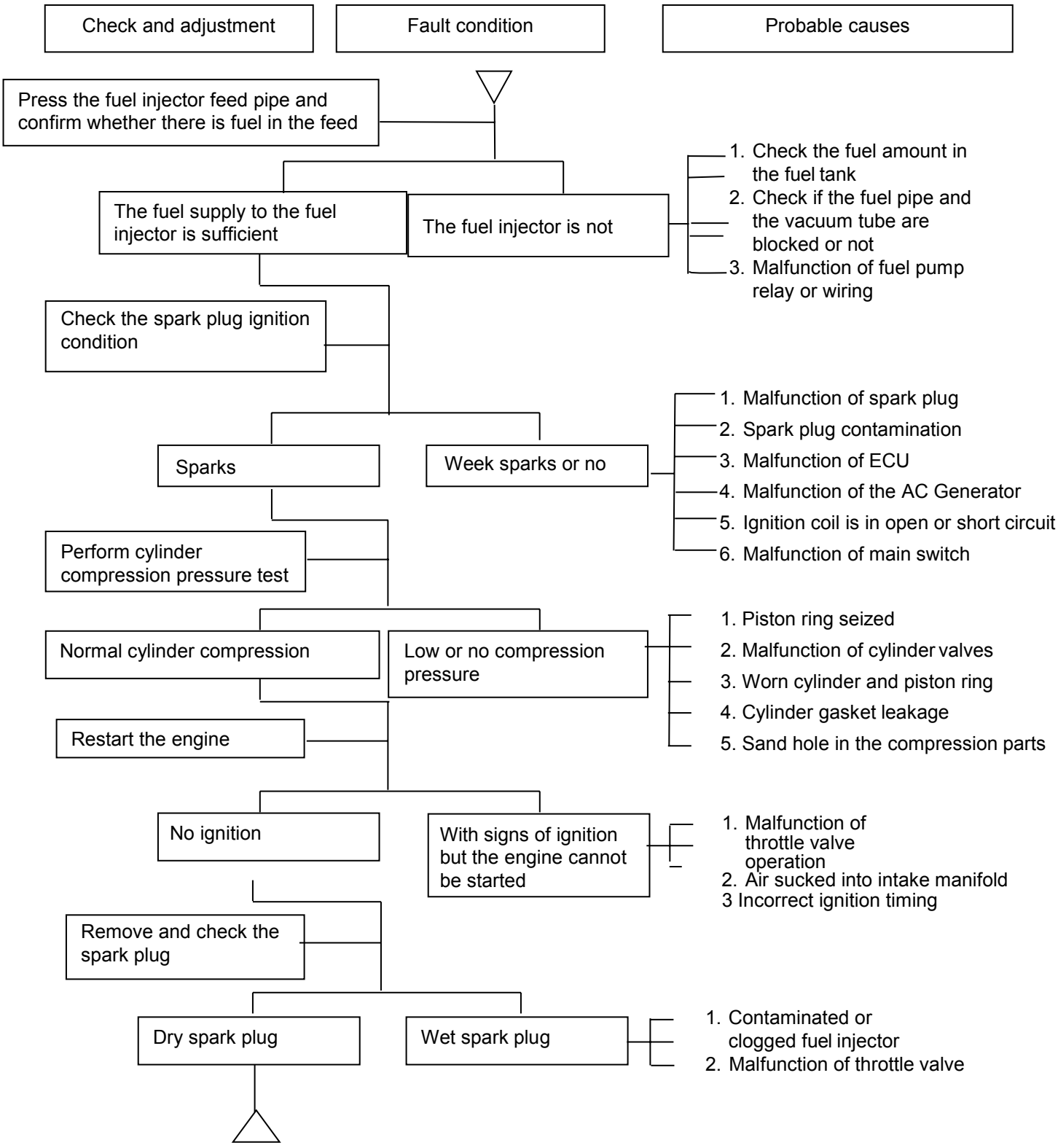
The torque values listed in above table are for more important tighten torque values.
Please see standard values for not listed in the table.

Standard Torque Values for Reference

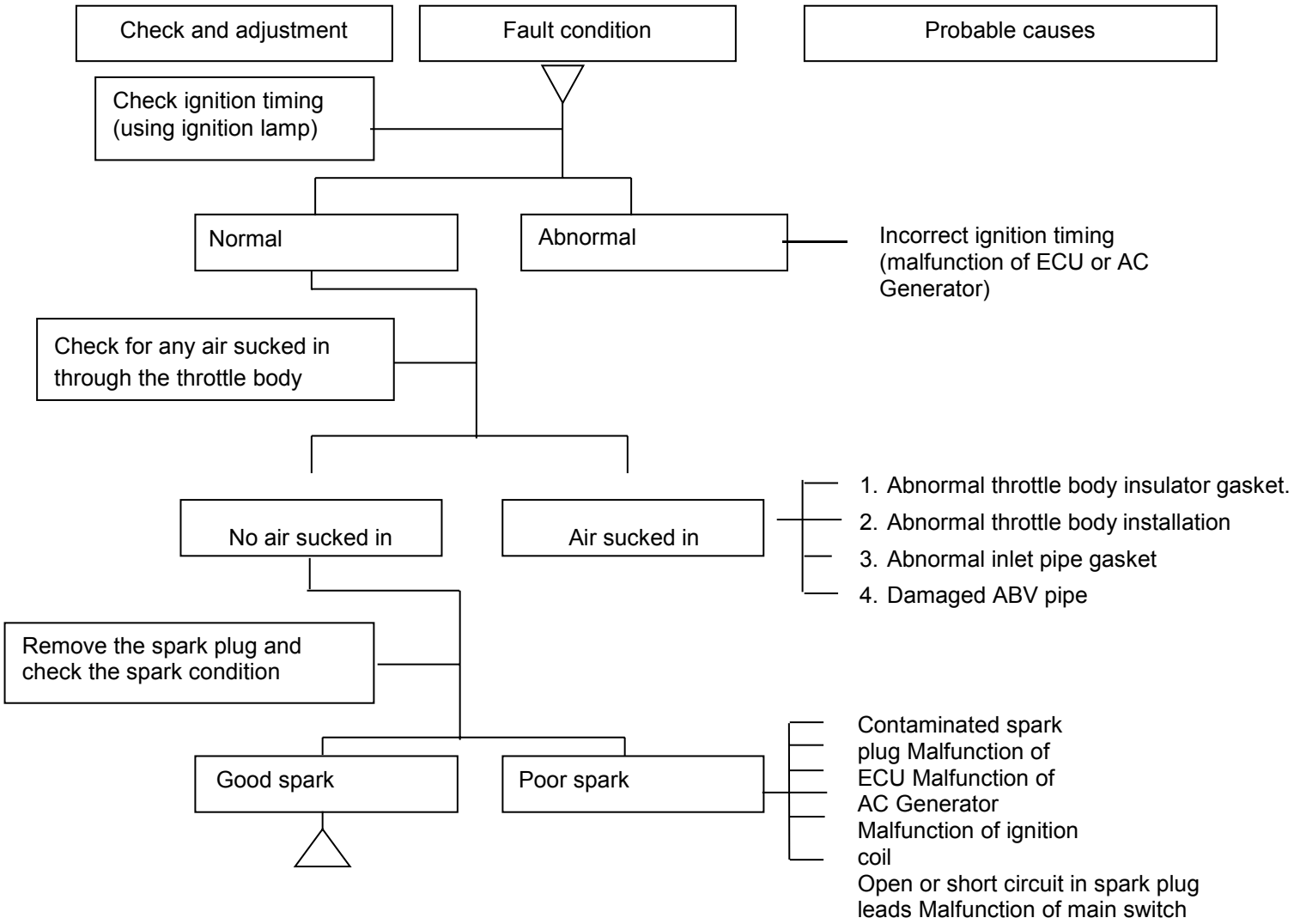
TYPE	TIGHTEN TORQUE	TYPE	TIGHTEN TORQUE
5mm bolt、nut	0.45~0.60kgf-m	3mm screw	0.05~0.08kgf-m
6mm bolt、nut	0.80~1.20kgf-m	4mm screw	0.10~0.15kgf-m
8mm bolt、nut	1.80~2.50kgf-m	5mm screw	0.35~0.50kgf-m
10mm bolt、nut	3.00~4.00kgf-m	6mm screw、SH nut	0.70~1.10kgf-m
12mm bolt、nut	5.00~6.00kgf-m	6mm bolt、nut	1.00~1.40kgf-m
		8mm bolt、nut	2.40~3.00kgf-m
		10mm bolt、nut	3.50~4.50kgf-m

TROUBLES DIAGNOSIS

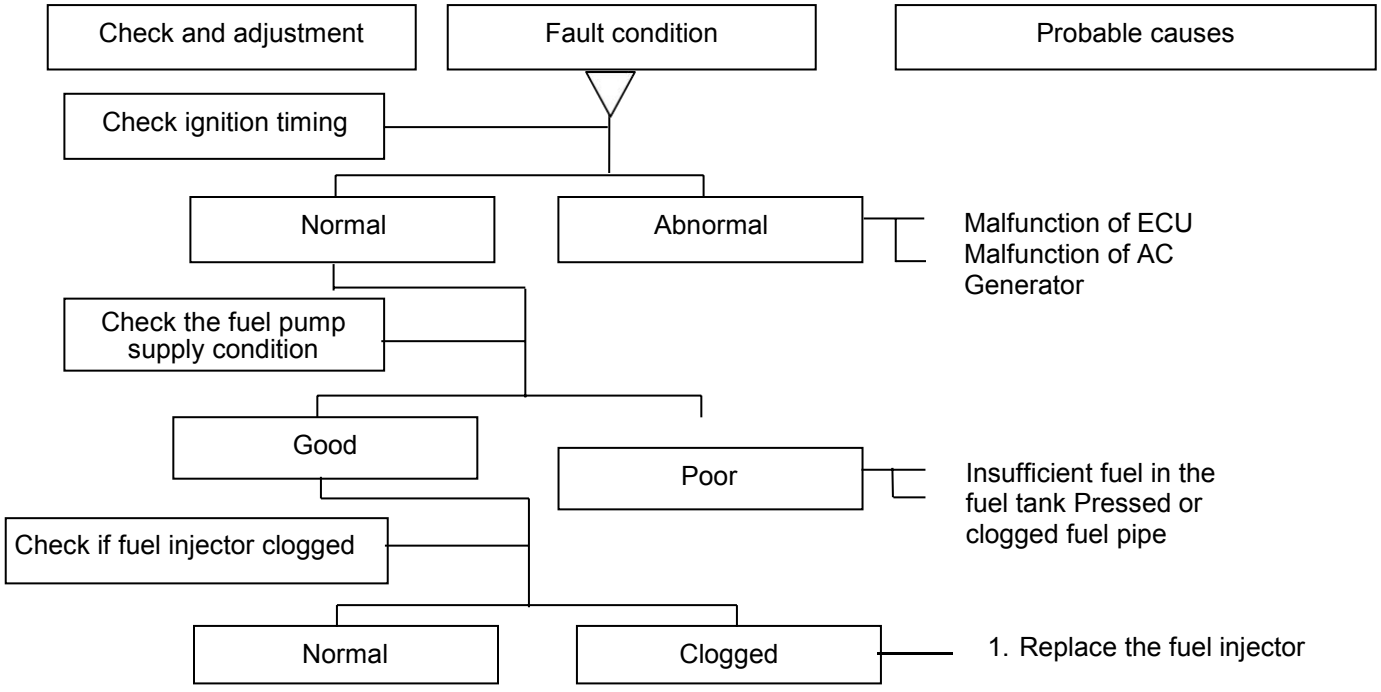
A. Engine hard to start or can not be started



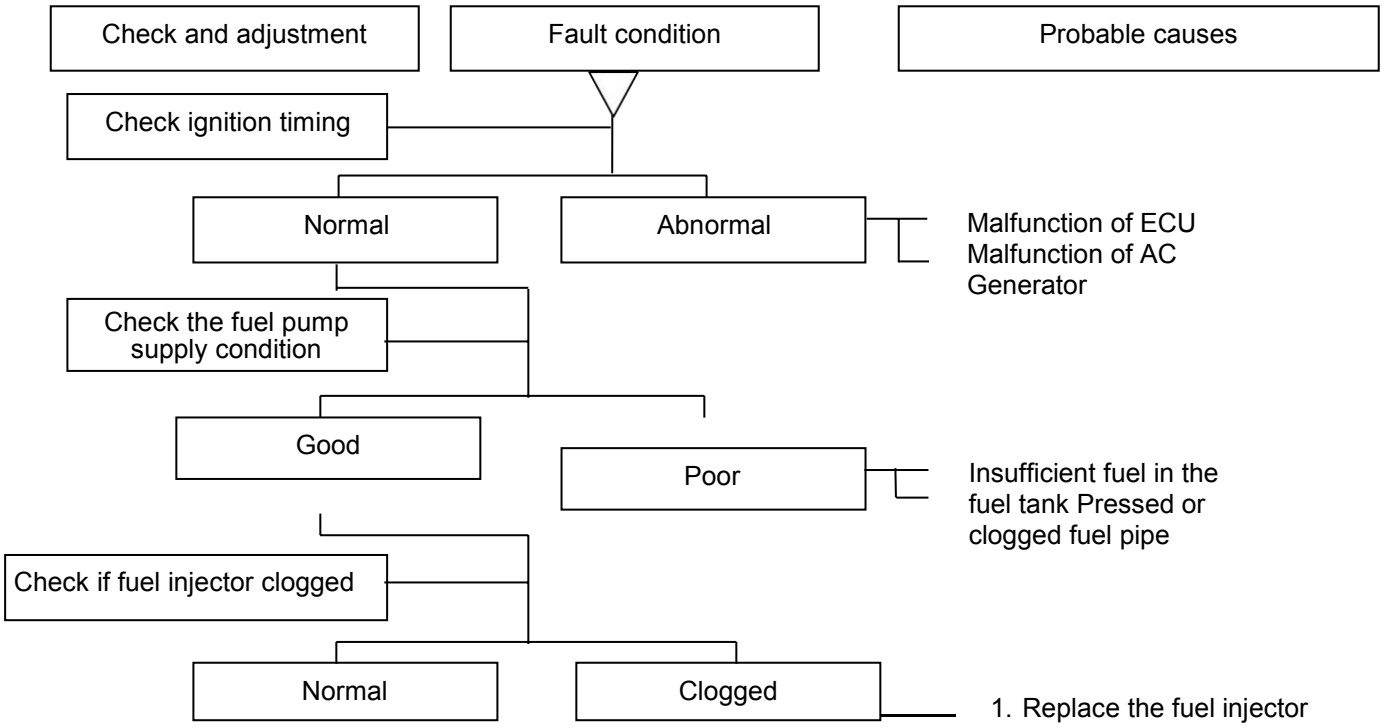
B. Engine runs sluggish (especially in low speed and idling)



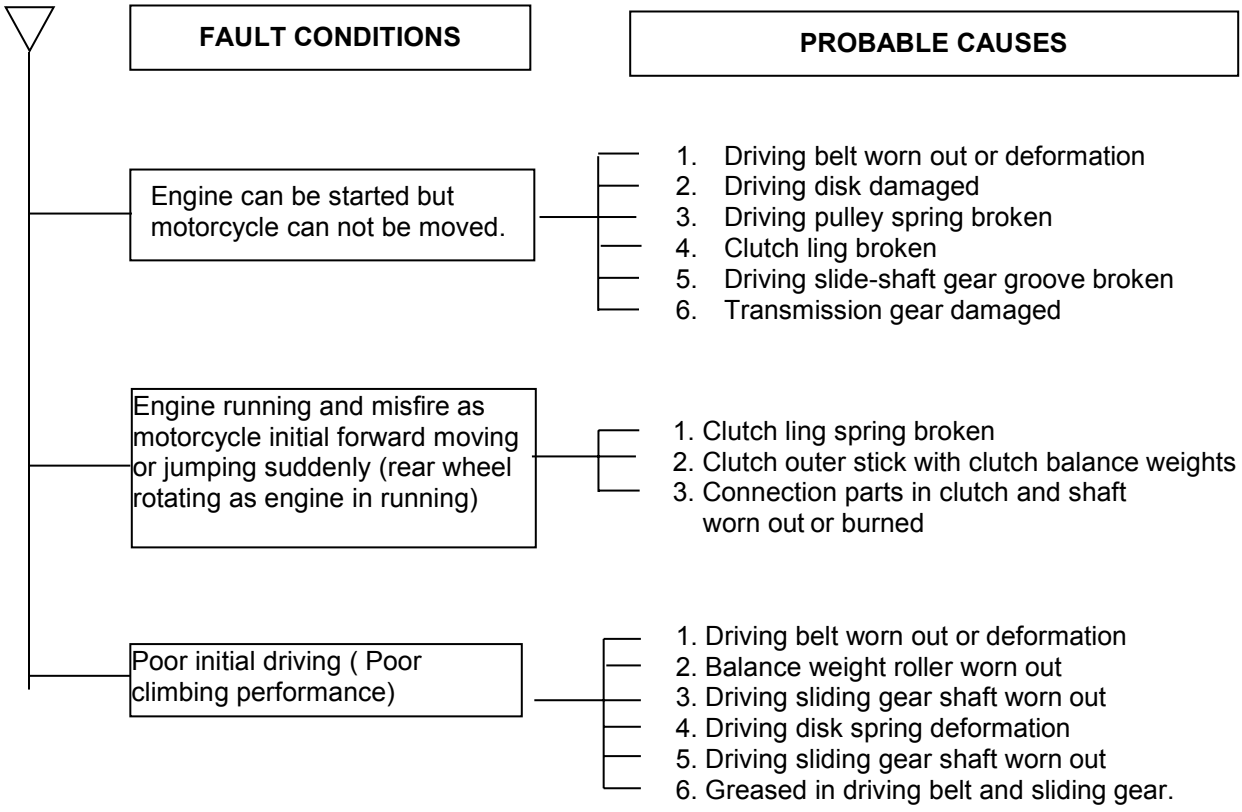
C. Engine runs sluggish (High speed)



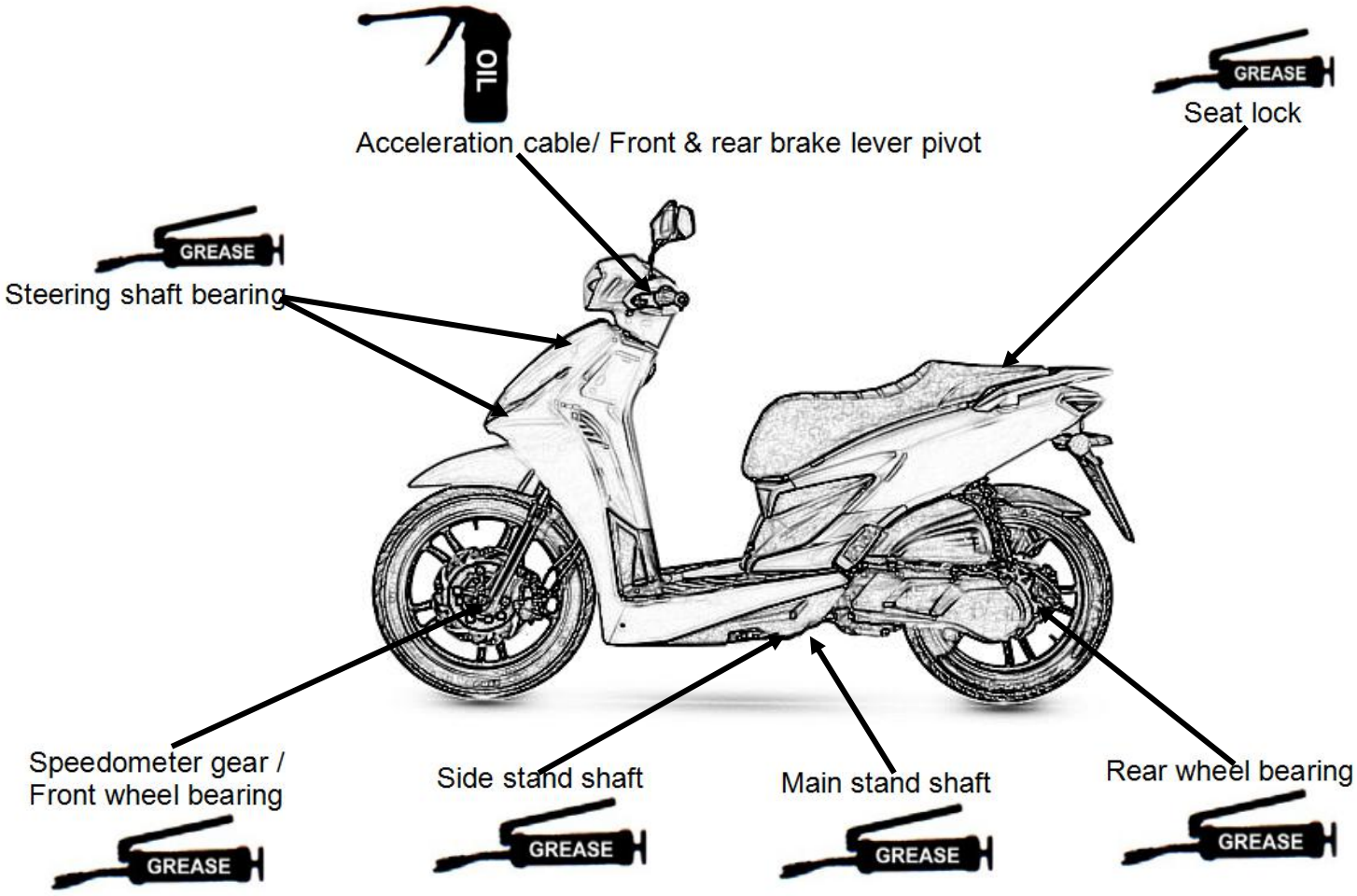
D. Engine runs sluggish (High speed)



E. CLUTCH, DRIVING AND DRIVING PULLEY



LUBRICATION POINTS



2.MAINTENANCE INFORMATION

CONTENTS

PRECAUTIONS IN OPERATION

Specification

Fuel Tank Capacity	7.0L±0.2 L	
Engine Oil	capacity	0.9 L
	change	0.8 L
Transmission Gear oil	capacity	0.13 L
	change	0.11 L
Clearance of throttle valve		2~6 mm
Spark plug		NGK CR7HSA Gap: 0.6~0.7 mm
“F” Mark in idling speed		Before TDC 13º / 1700 rpm
Full timing advanced		Before TDC 27º / 8000 rpm
Idling speed		1700±100 r/min-1/
Cylinder compression pressure		10.68±0.2 kg/cm²
Valve clearance: IN/EX		0.12±0.02 mm
Tire dimension	front / rear	110/70-16 / 110/70-16
Tire pressure (cold)	single	Front: 225kPa rear: 225 kPa
	Two persons	Front: 225kPa rear: 225kPa
battery		12V6Ah or 12V 7Ah

2. MAINTENANCE INFORMATION

PERIODICAL MAINTENANCE SCHEDULE

Maintenance Code	Item	Initial 300KM	1 Month Every1000KM	3 month Every3000KM	6 month Every6000KM	1 year Every12000KM
1	☆ Air cleaner	I		C	C	R
2	☆ Fuel filter	I			I	R
3	☆ Oil filter	C			C	C
4	☆ Engine oil change	R	Replacement for every 1000km			
5	Tire pressure	I	I			
6	Battery inspection	I	I			
7	Brake & free play check	I	I			
8	Steering handle check	I	I			
9	Cushion operation check	I	I			
10	Every screw tightening check	I	I			
11	Gear oil check for leaking	I	I			
12	☆ Spark plug check or change	I		I	R	
13	☆ Gear oil change	R	Replacement for every 5000km			
14	Frame lubrication				L	
15	Exhaust pipe	I	I			
16	☆ Ignition timing	I	I			
17	☆ Emission check in Idling	A	I			
18	☆ Throttle operation	I		I		
19	☆ Engine bolt tightening	I		I		
20	☆ CVT driving device (belt)				I	R
21	☆ CVT driving device (roller)				C	
22	Lights/electrical equipment/mutli-meters	I	I			
23	Main/side stands & springs	I			I	
24	Fuel pipes	I		I		
25	Cam chain	I		I		
26	☆ Valve clearance	I		A		
27	☆ Crankcase blow-by over-flow pipe	I	Replacement for every 2000km			

Code: I ~ Inspection, cleaning, and adjustment R ~ Replacement C ~ Cleaning (replaced if necessary) L ~ Lubrication Have your motorcycle checked, adjusted.The above maintenance schedule is established by taking the monthly 1000 kilometers as a reference which ever comes first.

Remarks:

1. **These marks "☆" in the schedule are emission control items. According to EPA regulations, these items must be perform normally periodical maintenance following the use r manual instructions. They are prohibited to be adjusted or repaired by unauthorized people.**
2. **Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the Heavily- polluted environment.**
3. **Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.**
4. **Preventive maintenance**
5. **Ignition system - Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.**
6. **Carbon deposit removal - Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obvious lower than ever.**
7. **Replace worn out pistons, cylinder head.**

LUBRICATION SYSTEM

Engine Oil Capacity

⚠Caution

- The vehicle must be parked on a level ground when checking oil capacity.
- Run the engine for 2-3 minutes then stop, wait about 2-3 more minutes allowing engine oil to settle before checking the oil level.

Remove dipstick to check the oil level. If oil level is below the lower limit mark, add oil to the specified upper limit mark.

Oil change

Shut off the engine and remove dipstick. Remove the oil drain plug on the bottom-left of crankcase to drain oil.

After draining out oil, clean oil plug and its gasket and reins tall. Replace the gasket if it is damaged.

Torque value: 3.5~4.5 kgf-m

⚠Caution

- Warm up the engine. This will make the oil flow out easily.

Add oil to the specified capacity.

Oil Viscosity: SL 15W-40, recommended using King-Mate serial oil.

Engine oil capacity:

Disassembly: 0.9L

Change: 0.8L

When checking for oil leak, run the engine at idle speed for a few minutes, then check oil capacity with dipstick.

Cleaning the oil strainer

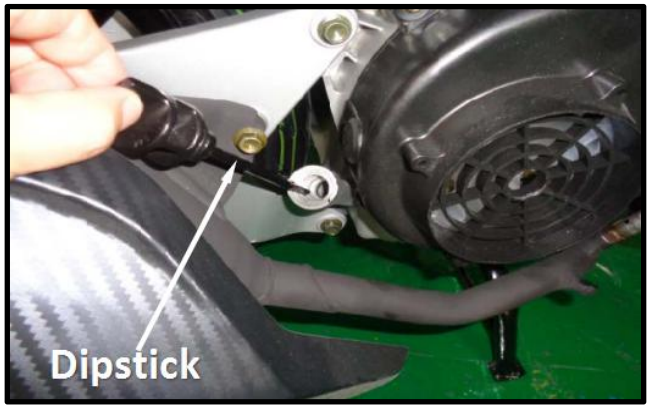
Drain oil from engine, remove the strainer cover, spring and strainer.

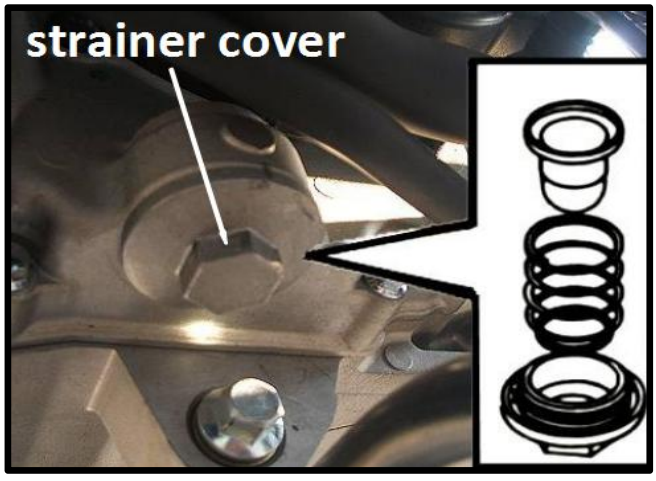
If there is an accumulation on the screen, wash it off with suitable solvent (recommended using compressed air).

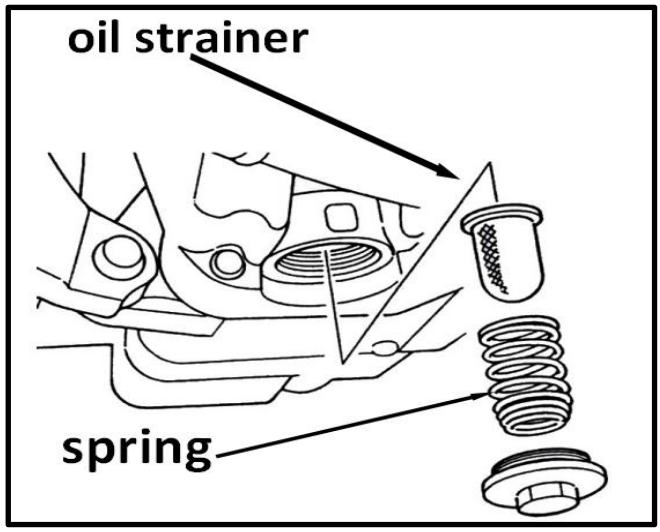
Check O-ring for damage, replace if necessary.

Reinstall strainer, spring, O-ring and strainer cover.

Torque value: 1.3~1.7 kgf-m





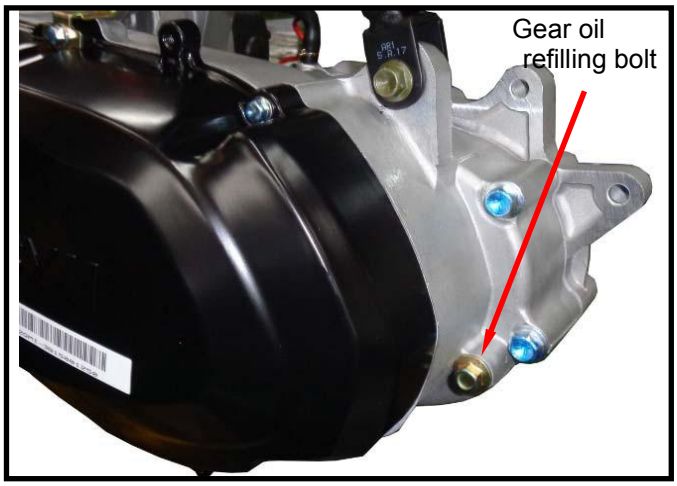


Gear Oil

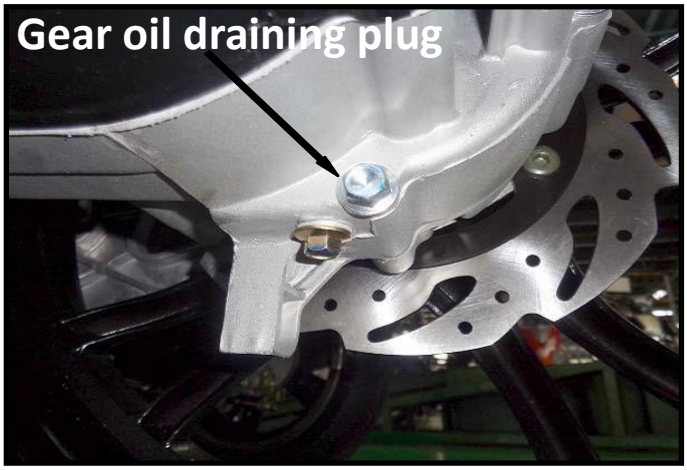
Inspection

Check gear oil if leaking.
Park the motorcycle with main stand on flat level place.
Turn off engine and remove the gear oil draining plug.
Place a measurement cup under the draining hole.
Remove the oil drain plug and drain gear oil into a measurement cup.
Check gear oil if enough.
Replacement
At first, remove the gear oil refilling bolt, and then remove the draining plug.
Install the draining plug after drained oil out.

Torque value: 0.8~1.2 kgf-m



Fill out gear oil to specified quantity from the engine oil filling hole.
Install the oil filling bolt.
Torque value: 0.8~1.2 kgf-m
Transmission oil capacity: 0.13 L(0.11 L for change)
Recommended: genuine gear oil (SGL 85W-90).



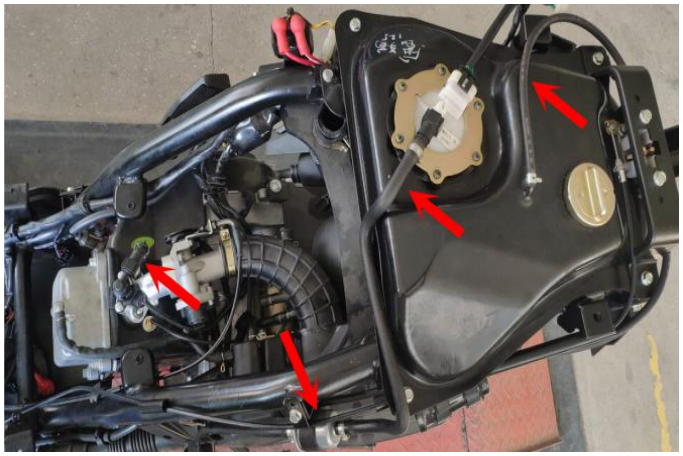
⚠Caution

- Inspect if washer is in good condition. Replace it with new one if it was deformed or damaged.

Fuel System

Fuel Pipe

Remove luggage box, side cover, center cover, body frame cover, and pedal, as well as front inner box.
Check all pipes, and replace it when they are deterioration, damage or leaking.



⚠Caution

- Gasoline is a low ignition material so any kind of fire is strictly prohibited as dealing it.

AIR CLEANER

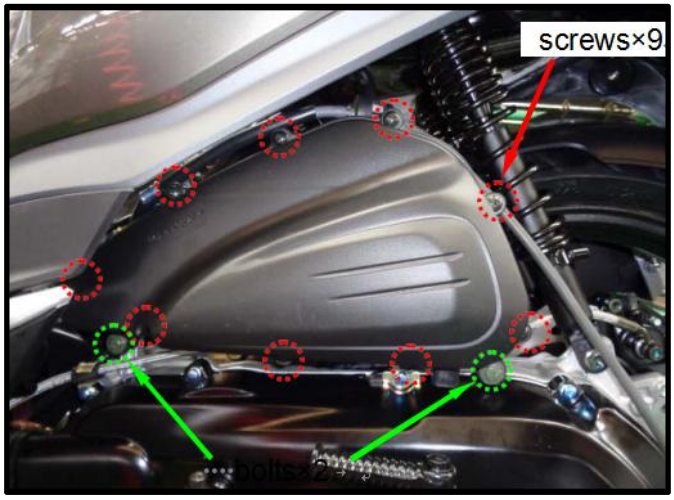
Element

Remove left side cover.

Remove 9 screws from the air cleaner cover.

Remove element of air cleaner (2 bolts).

Check the element if dirt or damaged. Replace it with new one if dirt or damaged.



⚠Caution

- Air cleaner element contains a paper made filter so do not try to clean it.
- Make sure that the air cleaner cover had been installed properly after installation.

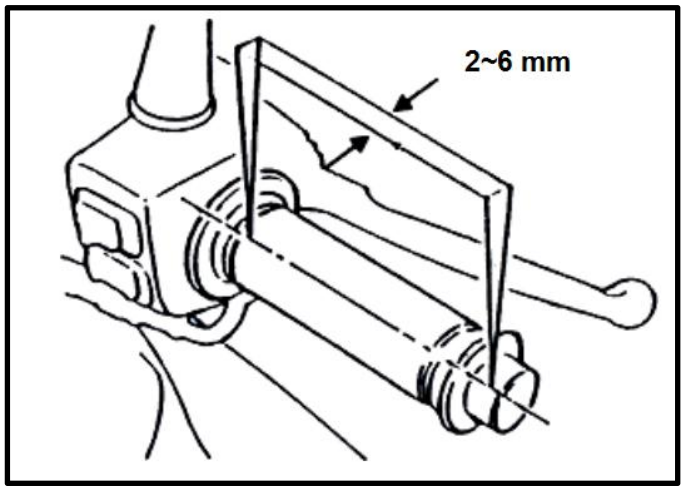
THROTTLE VALVE OPERATION

Have a wide open of throttle valve as handle bar in any position and release it to let back original (full closed) position.

Check handle bar if its operation is smooth. Check throttle valve cable and replace it if deteriorated, twisted or damaged.

Lubricate the cable if operation is not smooth.

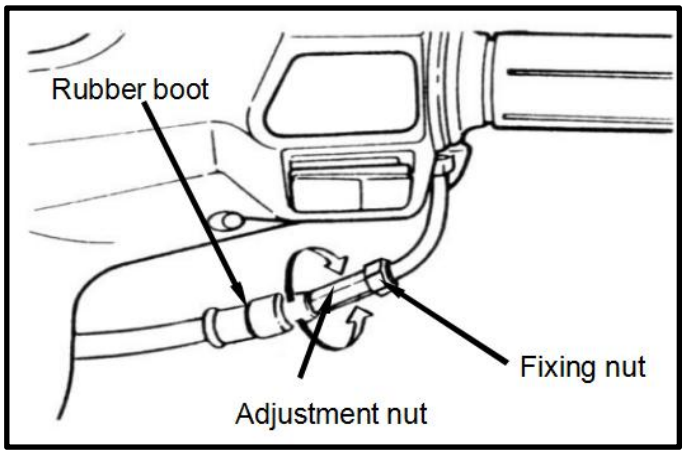
Measure handle bar free play in its flange part.



Free play：2~6 mm

Adjustment can be done in either ends. Secondary adjustment is conducted from top side.

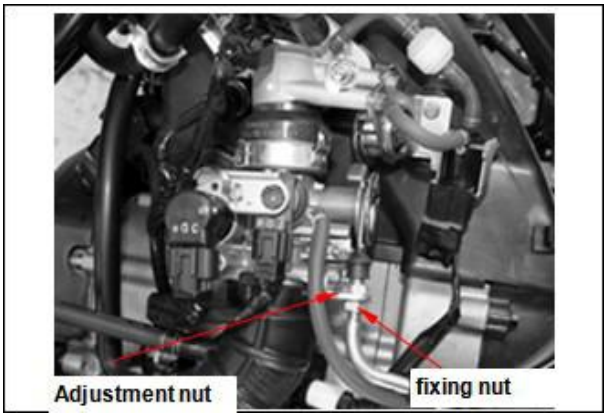
Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment nut.



Primary adjustment is conducted from button side.

Loosen fixing nut, and adjust by turning the adjustment nut.

Tighten the fixing nut, and check acceleration operation condition.

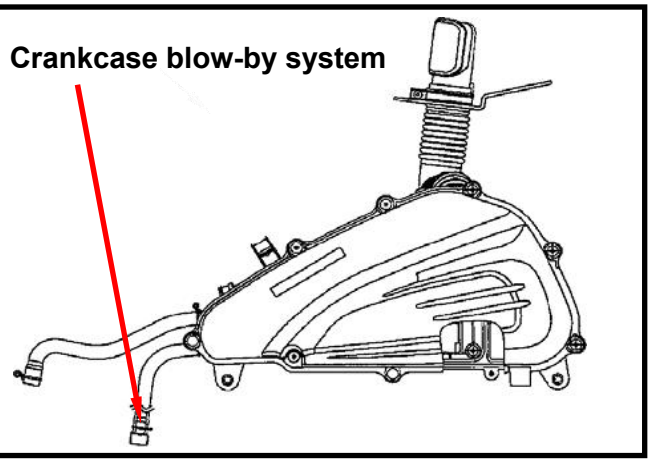


CRANKCASE VENTILATION

Pull out the plug from draining hose to clean deposits.

⚠Caution

- When always riding in rainy area or full throttle position, maintenance period must be shorted.
- The deposits can be seen in the transparent section of draining hose.



VALVE CLEARANCE ADJUSTMENT

⚠Caution

- Checks and adjustment must be performed when engine is cold (below 35℃).

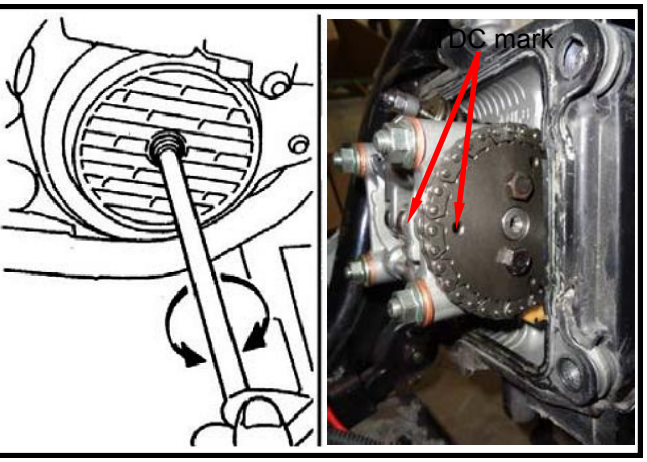
Remove luggage box and front center cover.

Remove the left body cover & left side cover.

Remove cylinder head cap.

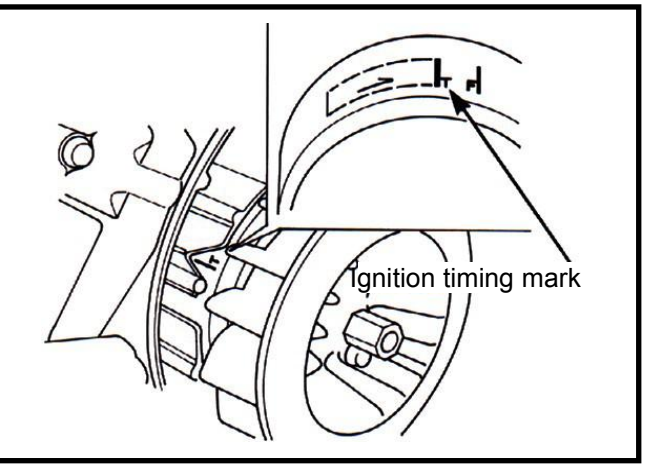
Remove the ignition timing check hole on the cooling fan cover.

With “T” type wrench, turn crankshaft in clockwise motion so that mark (“T”) on the generator flywheel aligns with the mark on the crankshaft, and camshaft is at TDC position also as same as level of cylinder head top-end. A single hole on camshaft sprocket is forward to up. (Piston is at TDC position in the compression stroke.)



⚠Caution

- The crankshaft can not be rotated in counter-clockwise to prevent from damage so that valve clearance can not be measured.



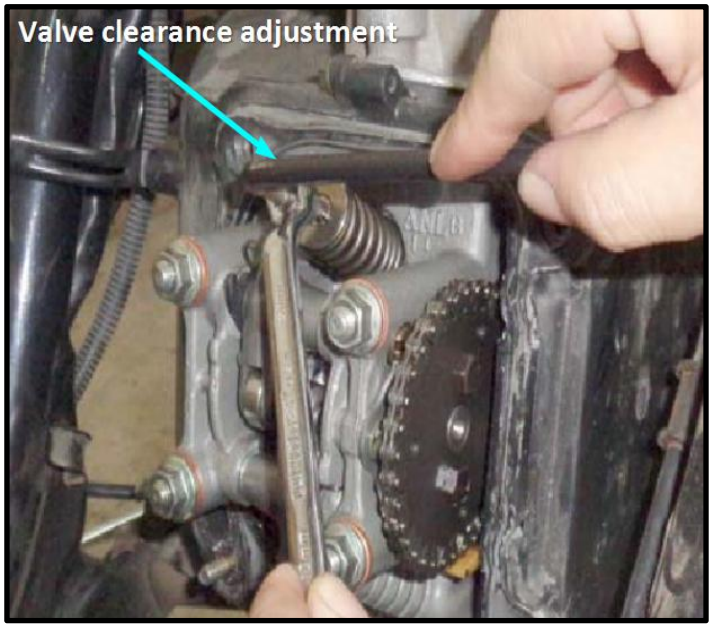
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

Check & adjust valve clearance with feeler gauge.

Valve clearance (IN/EX):

0.12±0.02 mm/0.12±0.02 mm

Loosen fixing nut and turn the adjustment nut for adjustment.



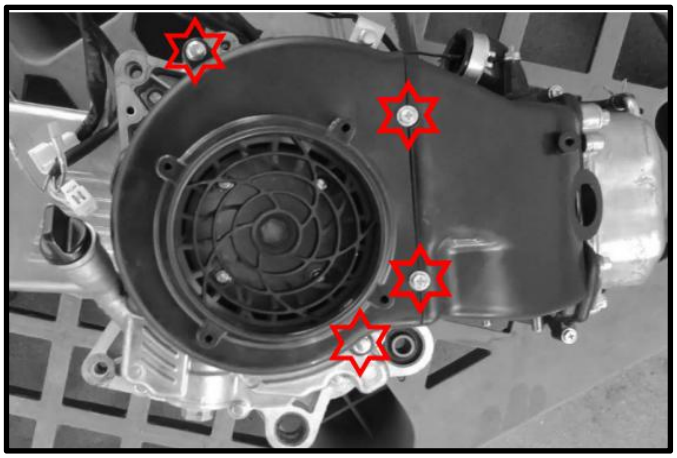
⚠Caution

- It has to make sure that valve-rocker arm is be adjusted to standard level when adjusting it, and re-check the valve clearance after tightened the fixing nut.

IGNITION SYSTEM

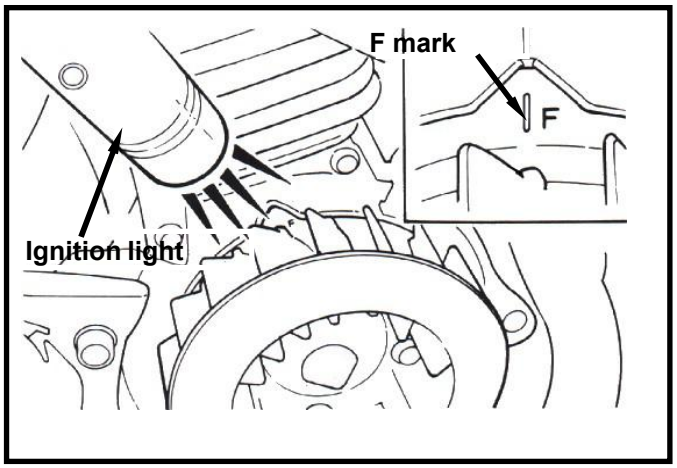
Ignition timing

> **⚠Caution**
>
> - Ignition system is set by manufacturer so it can not be adjusted.
> - Ignition timing check procedure is for checking whether function is in normal or not.



Remove right side cover.Remove ignition timing hole cap located on the cooling fan cap, or remove the cooling fan cap.

Check ignition timing with ignition light. Start engine and set engine idle speed in 1600 rpm, and if the mark aligns with the “F”, then it means that ignition timing is correct.



Increase engine speed to 5000 rpm to check ignition timing advance.

If the detent aligns with advance mark “ıı”, then it means ignition timing advance is in functional.

If not, check ECU set, pulse flywheel, and pulse generator.

Replace these components if malfunction of these parts are found.

SPARK PLUG

Appointed spark plug: CR7HSA

Remove luggage box. Remove body side cover.

Remove front center cover.

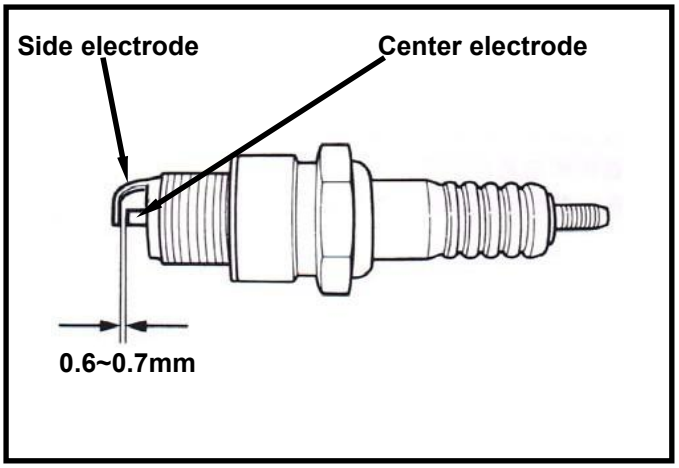
Remove spark plug cap.

Clean dirt around the spark plug hole.

Remove spark plug.

Measure spark plug gap.

Spark plug gap: 0.6~0.7 mm



Carefully bend ground electrode of the plug to adjust the gap if necessary.

Screw the park plug into the plug hole with hands, then tighten the plug with a wrench to prevent from damaging the spark plug's thread.

Torque value: 1.0~1.2 kgf-m

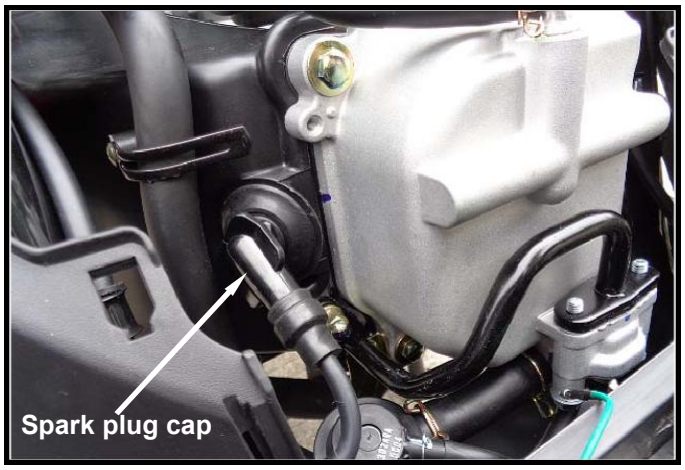
Connect spark plug cap

CYLINDER COPMRESSION PRESSURE

Warn up engine and then turnoff the engine. Open the seat. Remove the luggage box.

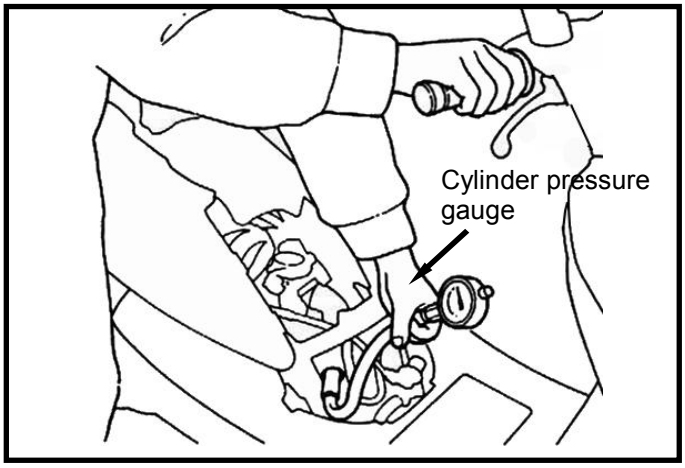
Remove spark plug cap and spark plug. Install compression gauge.

Full open the throttle valve, and rotate the engine by means of stepping the kick-starting lever.



⚠Caution

- Rotate the engine until the reading in the gauge no more increasing.
- Usually, the highest pressure reading will be obtained in 4~7 seconds by electric start



Compression pressure: 10.68±0.2 Kg/cm² Check following items if the pressure is too low:

- Incorrect valve clearance
- Valve leaking
- Cylinder head leaking, piston, piston ring and cylinder worn out If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

DRIVING SYSTEM

DRIVING BELT

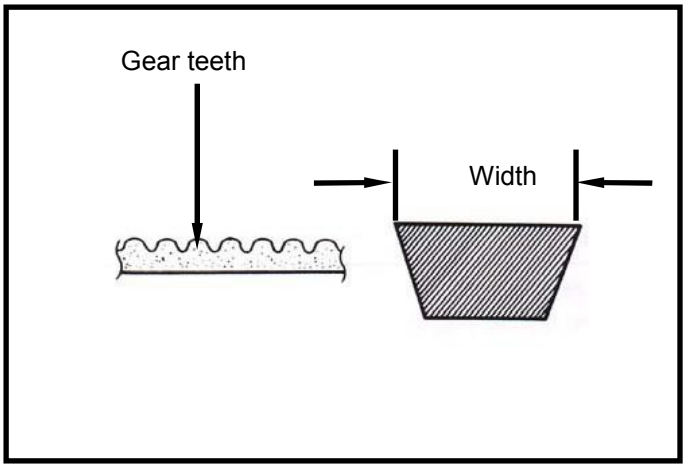
Remove left side cover.

Remove mounting bolt located under air cleaner.

Remove 9 bolts of the engine left crankcase.

Remove the left crankcase cover.

Check if the belt is crack or worn out. Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.

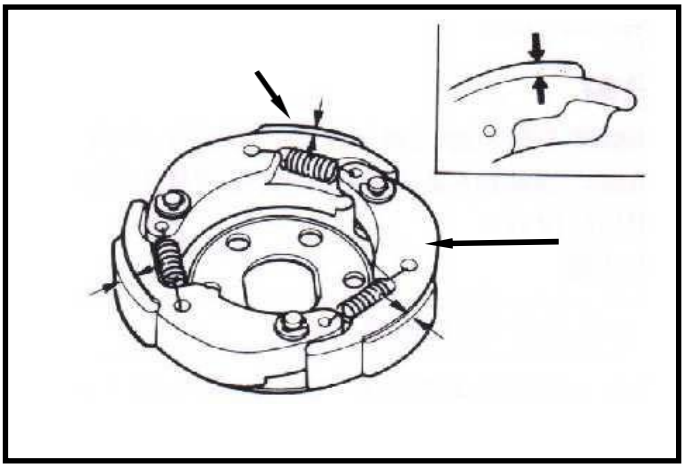


Width limit: above 17.5 mm

Clutch pad

Start the motorcycle and gradually increase throttle valve openness to check clutch pad operation.

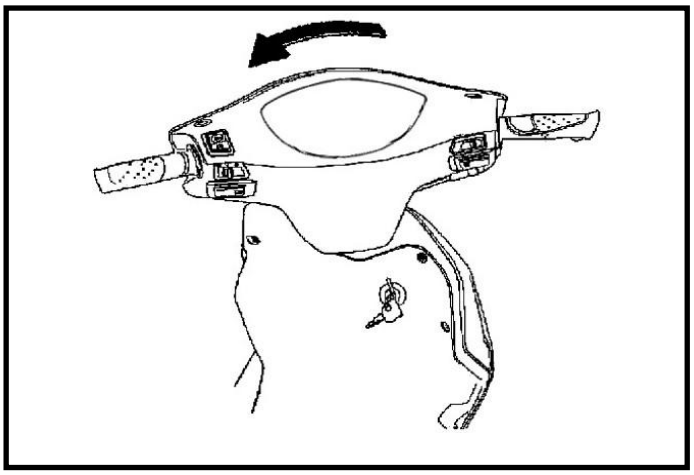
If the motorcycle moves with shaking, then check its clutch pad for wearing.Replace it if necessary.



STEERING SYSTEM

⚠Caution

- Check all wires and cables if they are interfered with the rotation of steering handle bar.

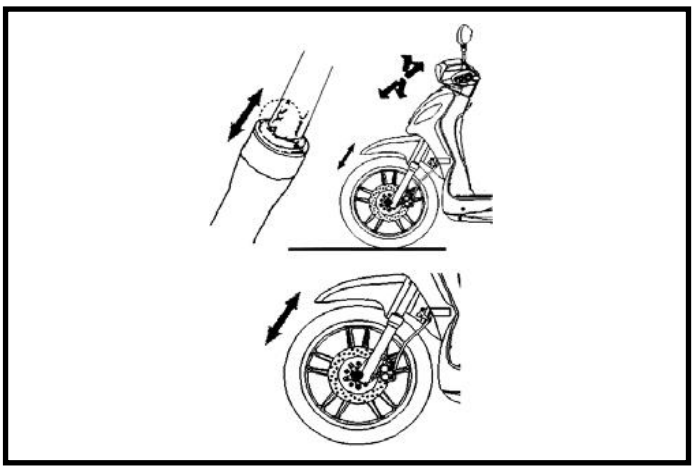


Lift the front wheel out of ground.
Turn handle from right to left and check if turning is smoothly.
If handle turning is uneven and bending, or the handle can be operated in vertical direction, then adjust the handle top bearing.

SUSPENSION SYSTEM

⚠Caution

- Do not ride the motorcycle with poor shock absorber.
- Looseness, wear or damage shock absorber will make poor stability and drivability.



Front shock absorber

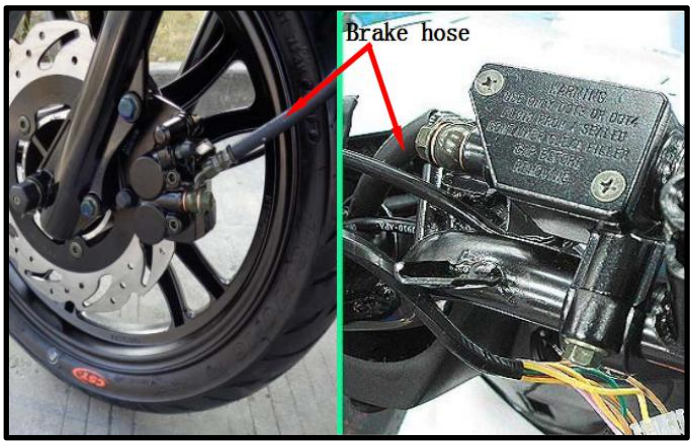
Hold front brake lever and press down the front shock absorber for several times to check its operation.
Hold front brake lever and push forward the front shock absorber for several times to check its locking status.
Check if it is scratched or leaking. Replace damaged and non-repairable components.
Tighten all nuts and bolts.

Rear Shock absorber

Press down the rear shock absorber for several times to check its operation.
Check if it is scratched or leaking. Replace damaged and non-repairable components.
Park the motorcycle with main stand.
Start engine and let the rear wheel rotate after increased engine rpm.
Check engine for any parts loose or shaking.
Also check the engine suspension bushing for wear out.
Replace the bushing if worn out.
Tighten all nuts and bolts.

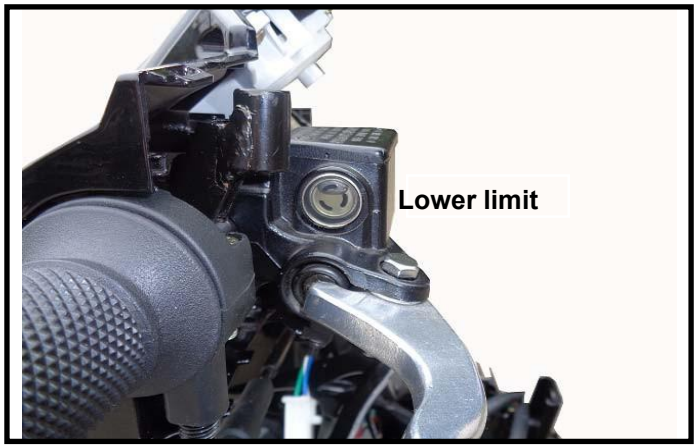
FRONT DISC BRAKE SYSTEM
BRAKE SYSTEM HOSE

Make sure the brake hoses for corrosion or leaking oil, and also check brake system for leaking.



BRAKE FLUID

Check brake fluid level in the brake fluid reservoir.
If the level is lower than the LOWER limit, add brake fluid to UPPER limit. Also check brake system for leaking if low brake level found.

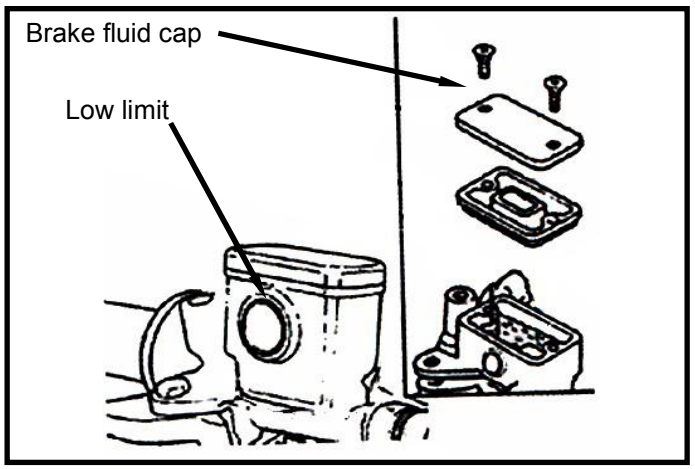


⚠Caution

- In order to maintain brake fluid in the reservoir in horizontal position, do not remove the cap until handle bar stop.
- Do not operate the brake lever after the cap had been removed.Otherwise, the brake fluid will spread out if operated the lever.
- Do not mix non-compatible brake fluid together.

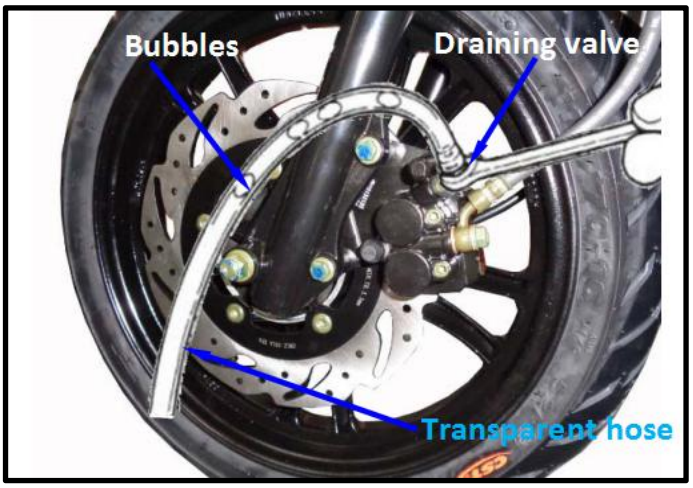
FILLING OUT BRAKE FLUID

Tighten the drain valve, and add brake fluid. Place the diaphragm in.
Operate the brake lever so that brake fluid contents inside the brake system hoses.



AIR BLEED OPERATION

Connect a transparent hose to draining valve.
Hold the brake lever and open air bleeding valve.
Perform this operation alternative until there is no air inside the brake system hoses.



⚠Caution

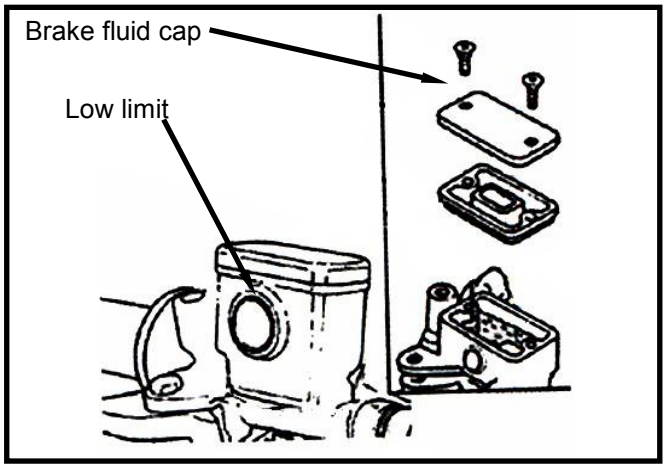
- Before closing the air bleed valve, do not release the brake lever.

ADDED BRAKE FLUID

Add brake fluid to UPPER limit lever. Recommended brake fluid: DOT3 or DOT4 WELL RUN brake fluid.

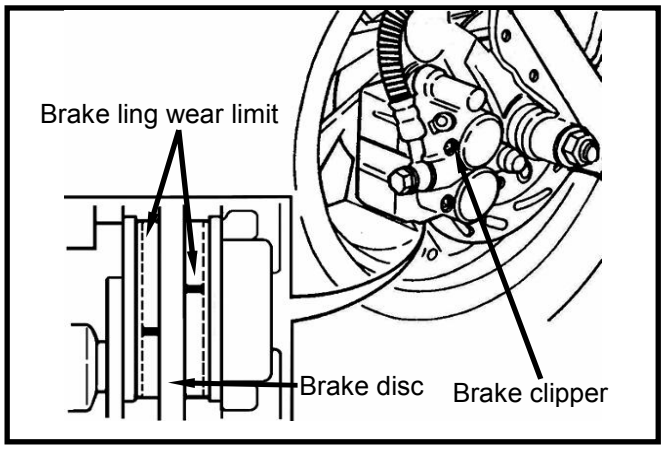
⚠Caution

- Never mix or use dirty brake fluid to prevent from damage brake system or reducing brake performance.



BRAKE LINING WEAR

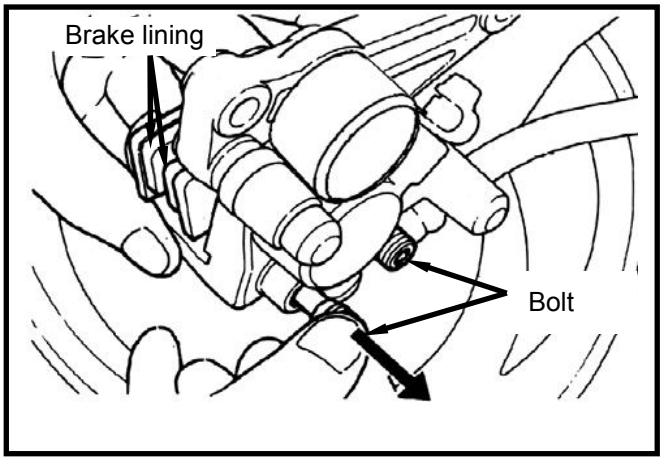
The indent mark on brake lining is the wear limitation. Replace the brake lining if the wear limit mark closed to the edge of brake disc.



Remove the brake clipper bolt, and take out the clipper.

⚠Caution

- It is not necessary to remove brake hose when replacing the brake lining.



Pry out the brake lining with a flat driver if lining be clipped.

⚠Caution

- Do not operate the brake lever after the clipper removed to avoid clipping the brake lining.

Remove brake lining bolt. Take out the lining.

⚠Caution

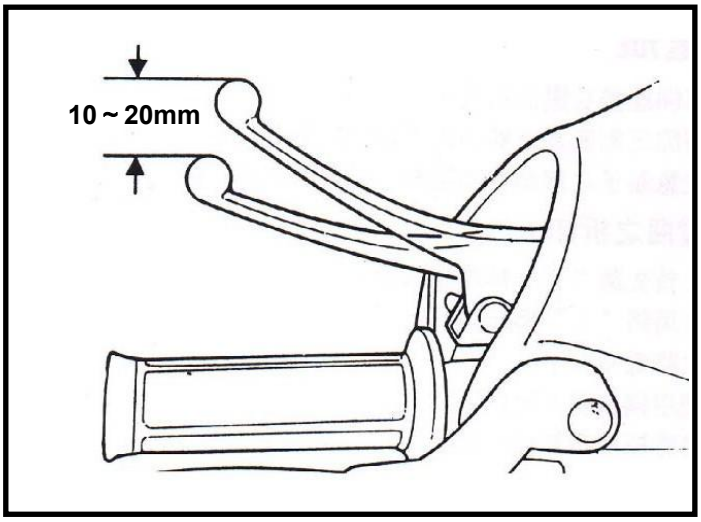
- In order to maintain brake power balance, the brake lining must be replaced with one set.

REAR BRAKE DISC SYSTEM

Front Brake Free Play:

Measure free play of rear brake level at the end of the lever.

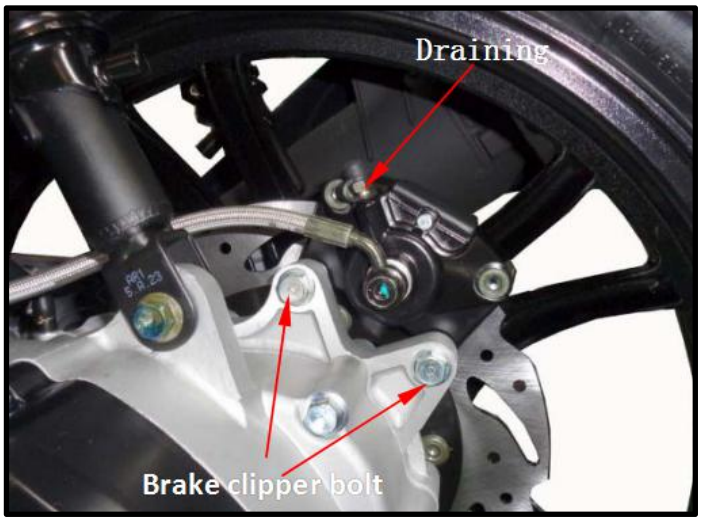
Free play: 10-20 mm



Adjust the free play by turning the front brake adjustment nut if necessary.

⚠Caution

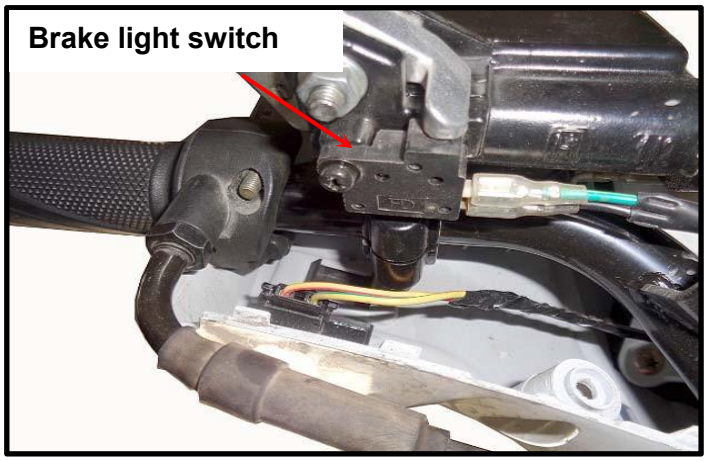
- After brake adjustment, it has to check the brake operation to make sure the front and rear wheel can be braked.



BRAKE LIGHT SWITCH

The brake light switch is to lit up brake light as brake applied.

Make sure that electrical starter can be operated only under brake applying.

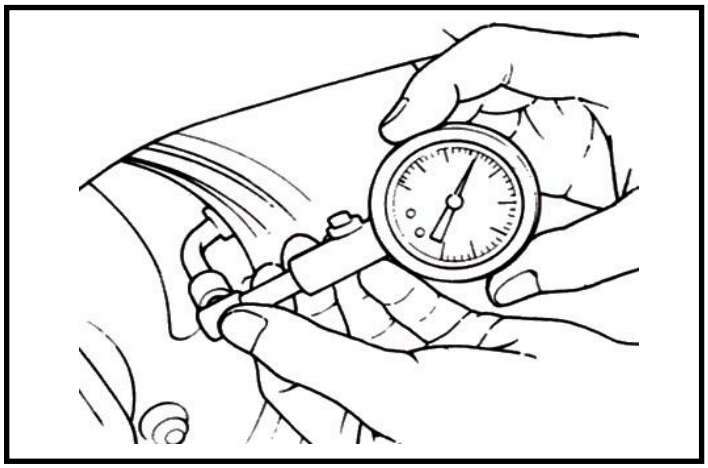


WHEEL/TIRE

Check if both front and rear tire pressure are within specification.

⚠Caution

- Tire pressure check should be done as cold tire.

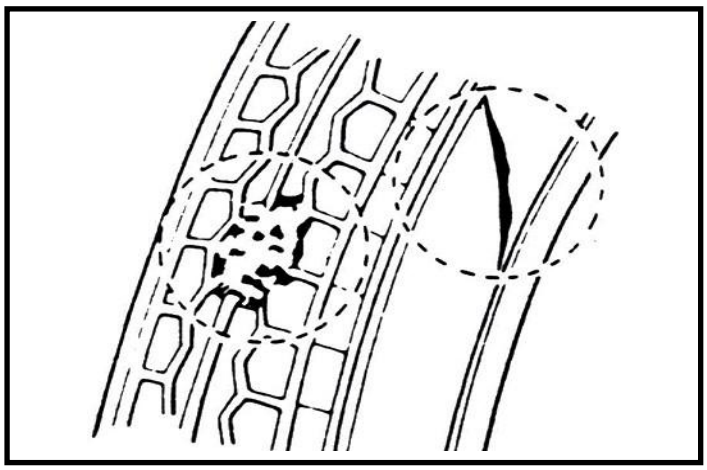


Appointed tire pressure

Appointed Tire

Front/Rear wheel: 110/70-16

Tire size		Front tire	Rear tire
Tire pressure as cold tire (Kg/cm²)	Load for single	225kPa	225kPa
	Load for two persons	225kPa	225kPa



Check if tire surface is ticked with nails, stones or other materials.

Check if tire surface or wall for crack or damaged, and replace it if necessary. The tire tread depth can be checked by visual inspection or depth gauge.

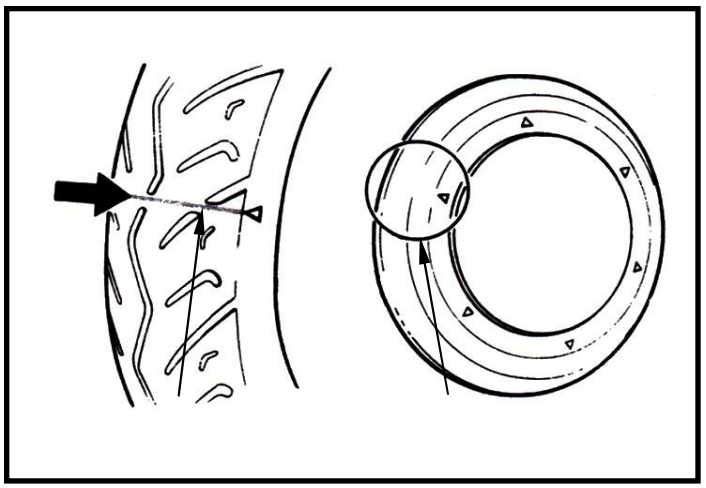
Replace the tire if tire tread dent or unusual wearing out.

The tire should be replaced if the wear limit mark (△) is in visible.

Measure tire thread depth from tire center surface.

Replace the tire if the depth is not come with **following specification:**

Front tire: 1.5 mm Rear tire: 2.0 mm



⚠Caution

- The wear limit marks (△) are located around the tire wall even for inspection.

BATTERY

Battery Removal

Remove the 2 screws on the floor panel. Remove battery cap. (2 nuts)

Battery cables removal:

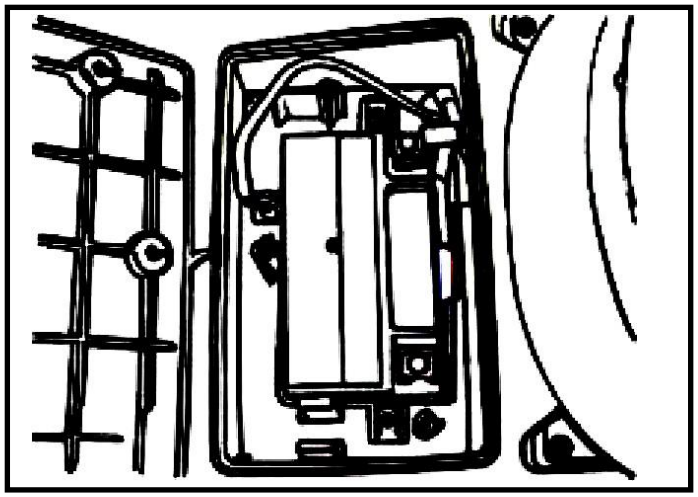
1.At first, remove the negative “-” cable.

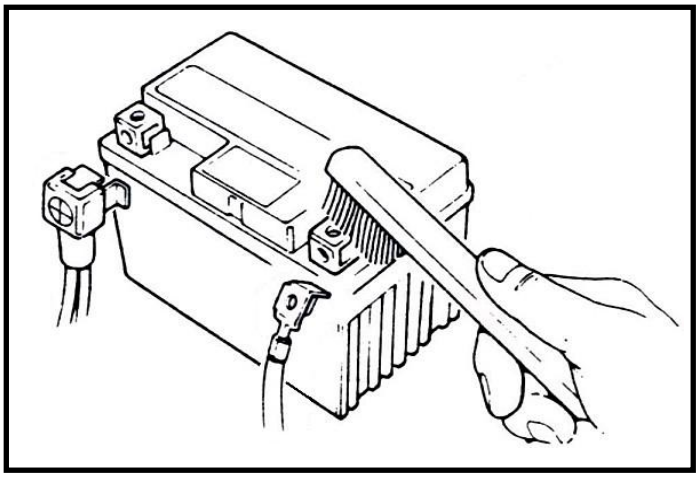
2.Then, remove the positive “+” cable.

Remove the battery.

If there is some rust on battery posts, clean it with steel brush.

Install the battery in the reverse procedures of removal.





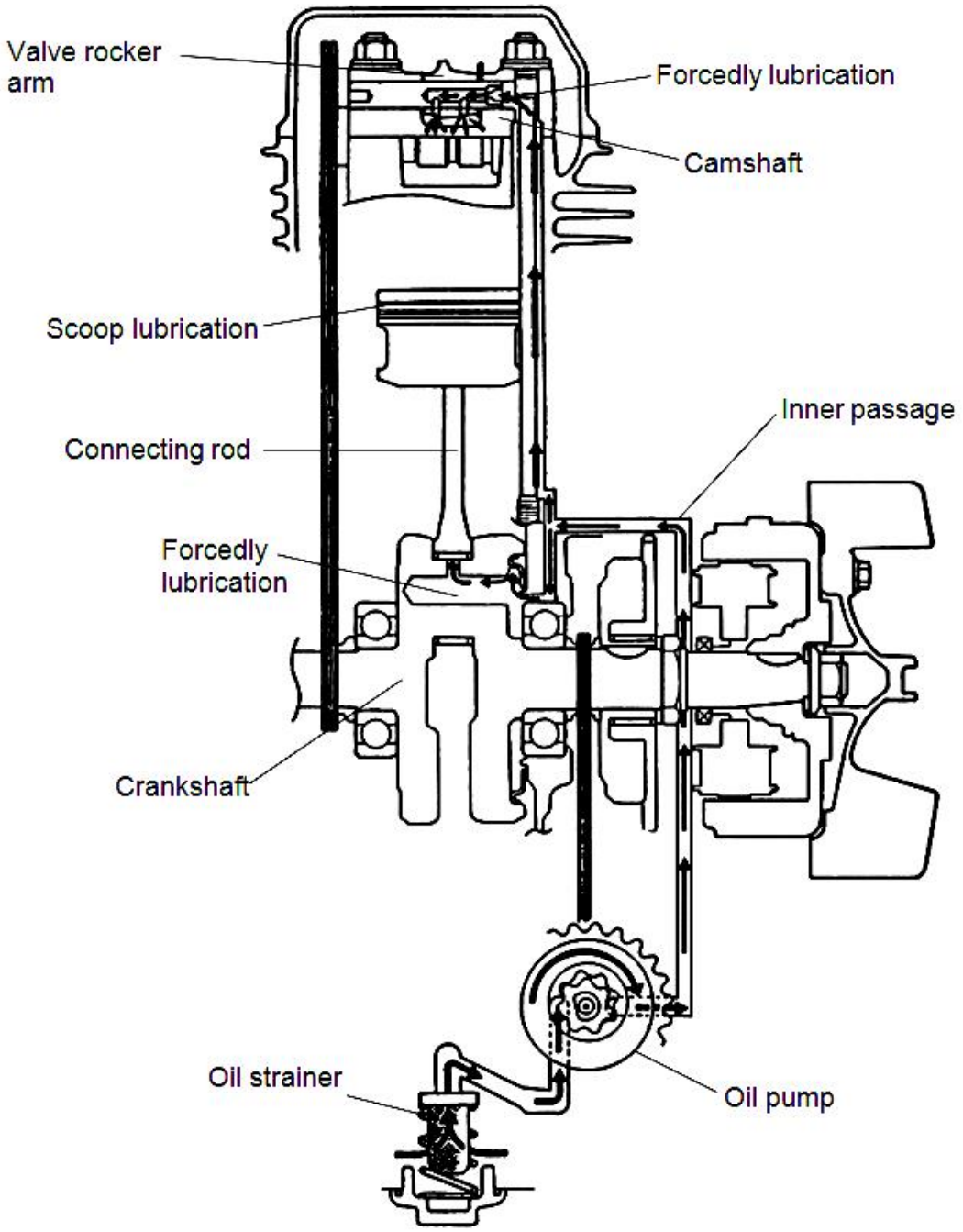
⚠Caution

- If there is rust on the posts very serious, spray some hot water on the posts. Then, clean it with steel brush so that can remove rust for more easily.
- Apply some grease on the posts after rust removed to prevent from rust again.

3.LUBRICATION SYSTEM

CONTENTS

MECHANISM DIAGRAM



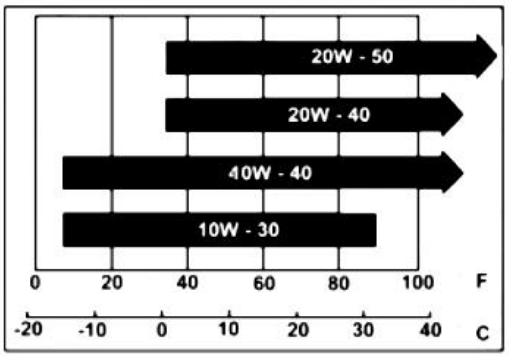
3. LUBRICATION SYSTEM

OPERATIONAL PRECAUTIONS

General Information

- This chapter contains maintenance operations for the engine oil pump, engine oil and gear oil.

Oil viscosity



Specifications

Engine oil quantity Disassembly 0.9L.
Replacement 0.8L.
Oil viscosity SL or SAE 15W-40 or equivalent
Gear Oil Capacity Disassembly 0.13L.
Replacement 0.11L.
Oil viscosity of gear oil SGL 85W-90

unit : mm

Items		Standard	Limit
Oil pump	Inner rotor clearance	-	0.12
	Clearance between outer rotor and body	-	0.12
	Clearance between rotor side and body	0.05~0.10	0.20

Torque value

- Engine oil drain plug 3.5~4.5kgf-m
- Engine oil screen cover 1.0~2.0kgf-m
- Gear oil drain bolt 1.0~1.5kgf-m
- Gear oil filling bolt 1.0~1.5kgf-m
- Oil pump drive sprocket nut 0.8~1.2kgf-m

TROUBLE DIAGNOSIS

Dirty oil

- No oil change in periodical
- Cylinder head gasket damage
- Piston ring worn out

Low engine oil level

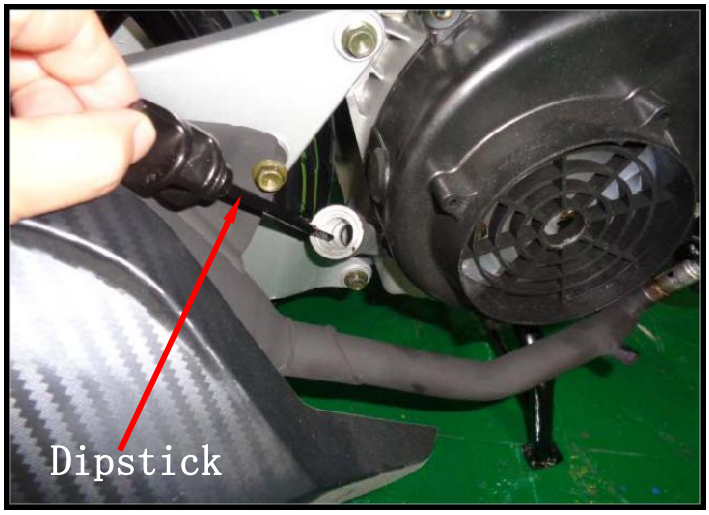
- Oil leaking
- Valve guide or seat worn out
- Piston ring worn out
- Low Oil Pressure

Low engine oil level

- Clogged in oil strainer, circuits or pipes
- Oil pump damage

ENGINE OIL

Turn off engine, and park the motorcycle in flat ground with main stand.
Check oil level with oil dipstick after 3-5 minutes.
Do not rotate the dipstick into engine as checking.
If oil level is nearly low level, fill out recommended oil to upper level.



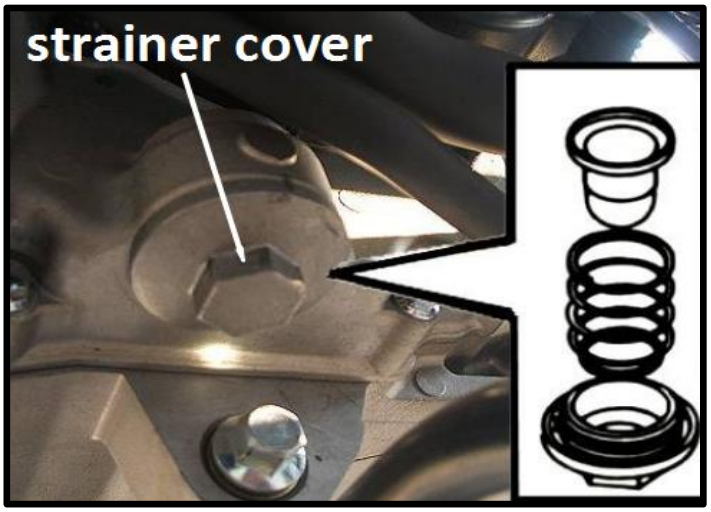
Oil Replacement

> **⚠ Caution**
> • Drain oil as engine warmed up so that make sure oil can be drained smoothly and completely.

Place an oil pan under the motorcycle, and remove oil strainer cap.
Make sure if the aluminum washer of the draining bolt is damaged. If so, replace it with new one.
Install the oil drain plug and tighten it.
Torque value: 3.5~4.5 kgf-m

CLEANING ENGINE OIL STRAINER

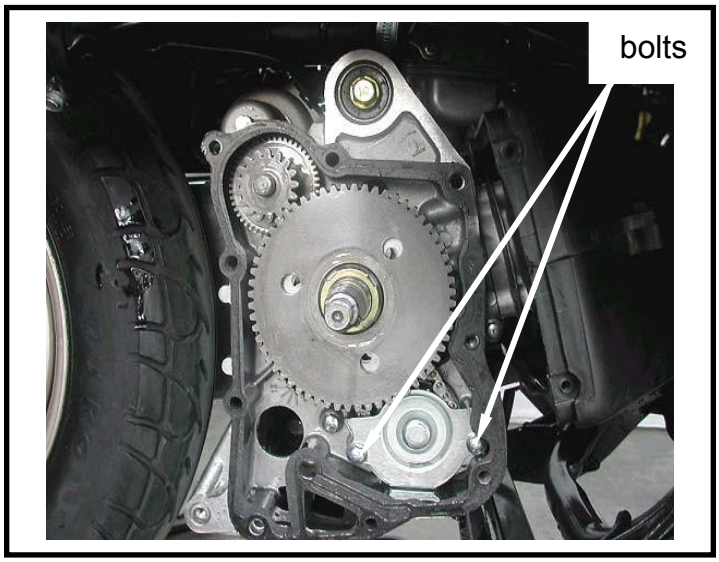
Remove the oil strainer cap. Remove oil strainer and spring.
Clean oil strainer (recommended using compressed air to clean dirty foreign).
Check if the strainer and O-ring of the oil strainer are broken. Replace with new one if found.
Install the oil strainer and spring.
Install the oil strainer cap and tighten it.
Torque value: 1.0~2.0 kgf-m
Fill out oil to the oil filler (Oil viscosity SL or SAE 15W-40).
Engine oil quantity: Replacement 0.8L



OIL PUMP

Oil Pump Removal

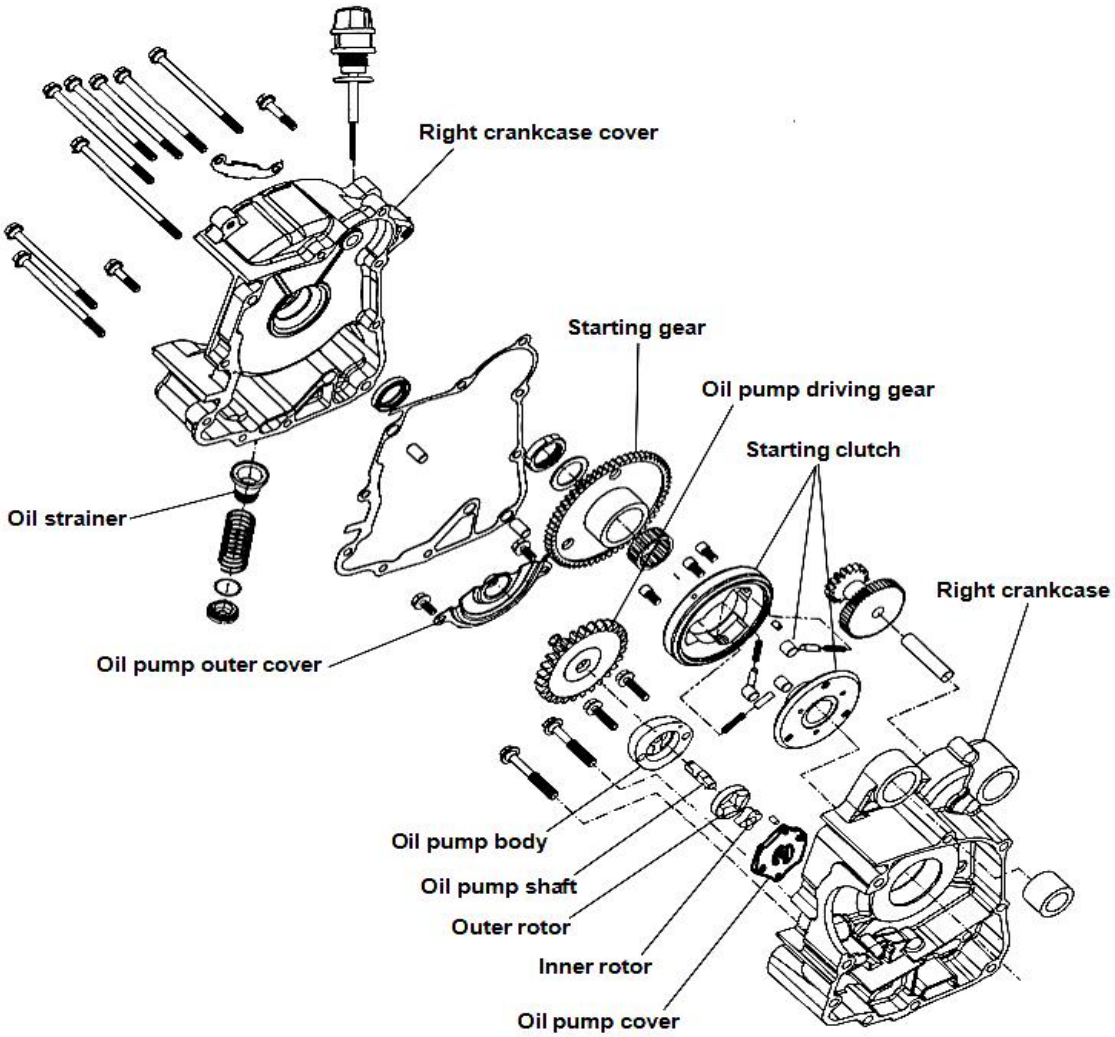
Remove the alternator (refer to chapter10). Remove the engine right crankcase cover. Remove the one-way clutch and starting drive gear (1 nut).



Make sure that the pump axle can be rotated freely.
Remove the oil pump cover (2 bolts),
Remove the oil pump fixing flat screw .
Remove oil pump body bolts (2 bolts).

Oil Pump Disassembly

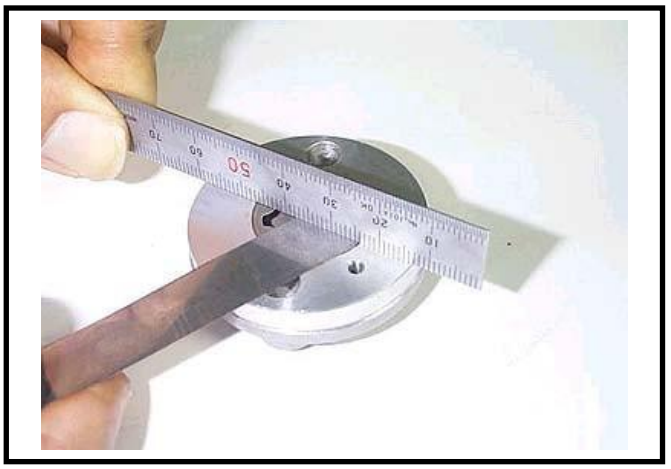
Remove the screw on oil pump cover.
Disassemble the oil pump as illustration shown.



Oil Pump Inspection
Check the clearance between oil pump body and outer rotor.
Limit: below 0.12 mm

Check clearance between inner and outer rotors.
Limit: below 0.12 mm

Check clearance between rotor side face and pump body.
Limit: below 2.0 mm

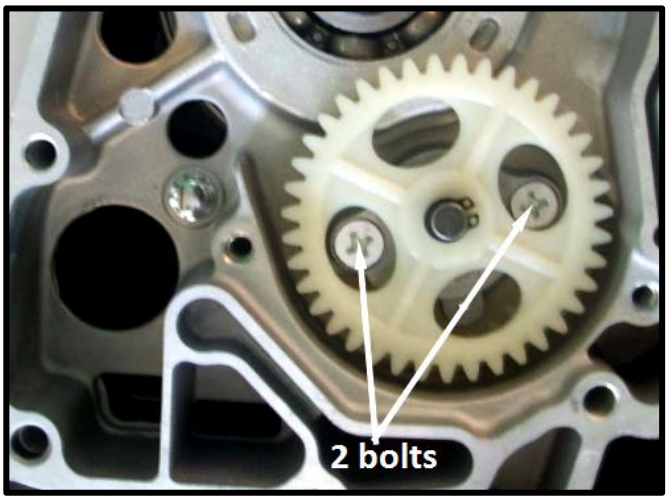


Oil Pump Re-assembly
Install inner and outer rotors into the pump body.
Align the indent on driving shaft with that of inner rotor. Install the driving shaft.
Install the oil pump cover and fixing pin properly and then tighten screw. (1 screw)

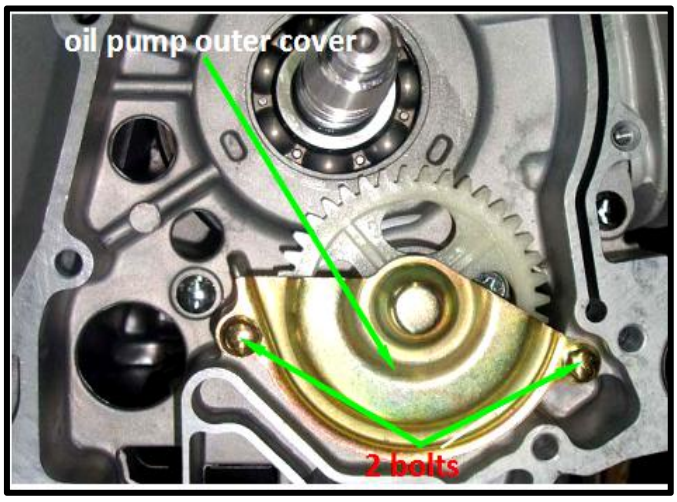
3-5

Oil Pump Installation

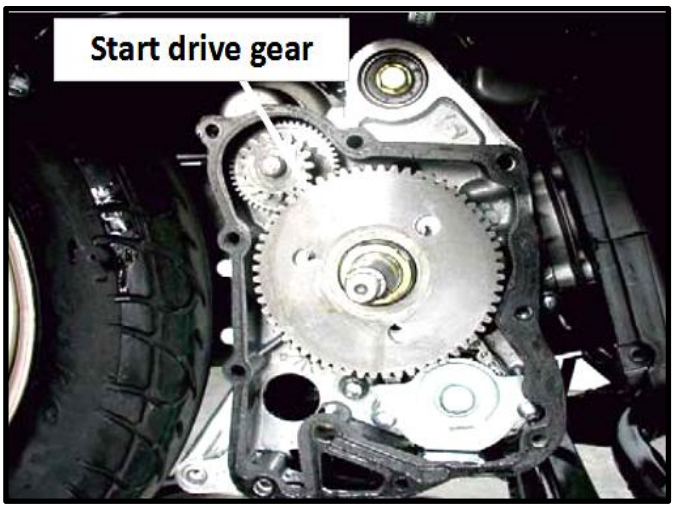
Install the oil pump (2 bolts).



Install oil pump outer cover (2 bolts).



Install the starting gear and the alternator. (Refer to chapter 10)

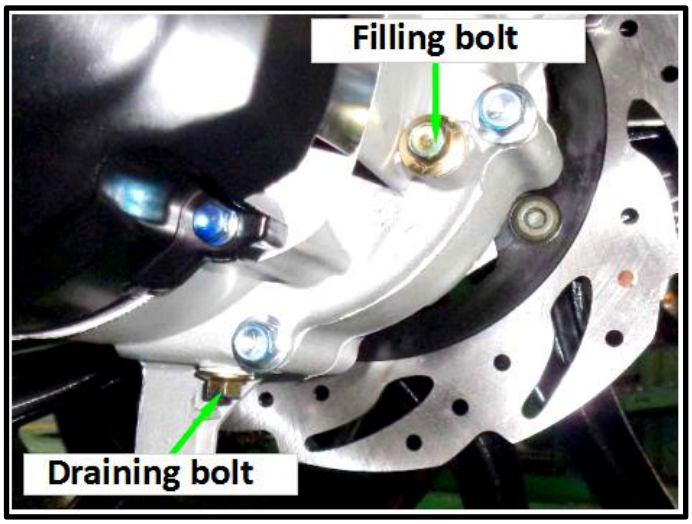


GEAR OIL

Oil Level Inspection

Park the motorcycle on flat ground with main stand.

Turn off engine and remove both engine oil filling bolt and oil draining bolt.



Remove gear oil filling hole bolt and place a measurement cup under the draining plug. Remove the oil draining plug and the pour gear oil into the measurement cup.

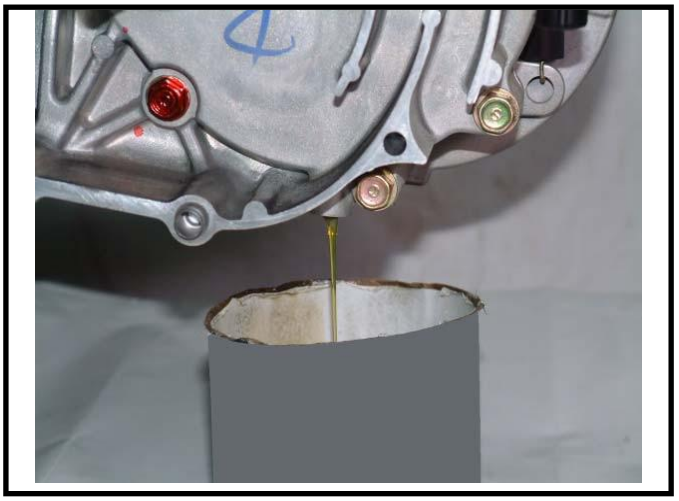
Measure the gear oil quantity if within standard value.

Add specified gear oil if the oil level too low. Standard quantity: 0.13L.

Replacement:0.11L.

Gear Oil Replacement

Remove the gear oil filling hole bolt and its draining plug and then drain oil completely. Install the draining plug and tighten it. (Make sure if the plug washer is damaged. If so, replace it with new one.)



Torque Value：1.0~1.5 kgf-m

Add new gear oil (0.13L.) from the gear oil filling hole and then install the gear oil filling hole bolt after added oil. And then, tighten the bolt.

Torque Value: 1.0~1.5 kgf-m

※Recommended to apply with GEAR OIL (SGL 85W-90)

Start engine and run it for 2~3 minutes.

Turn off engine and check if oil leaking.

4.Fuel Injection System

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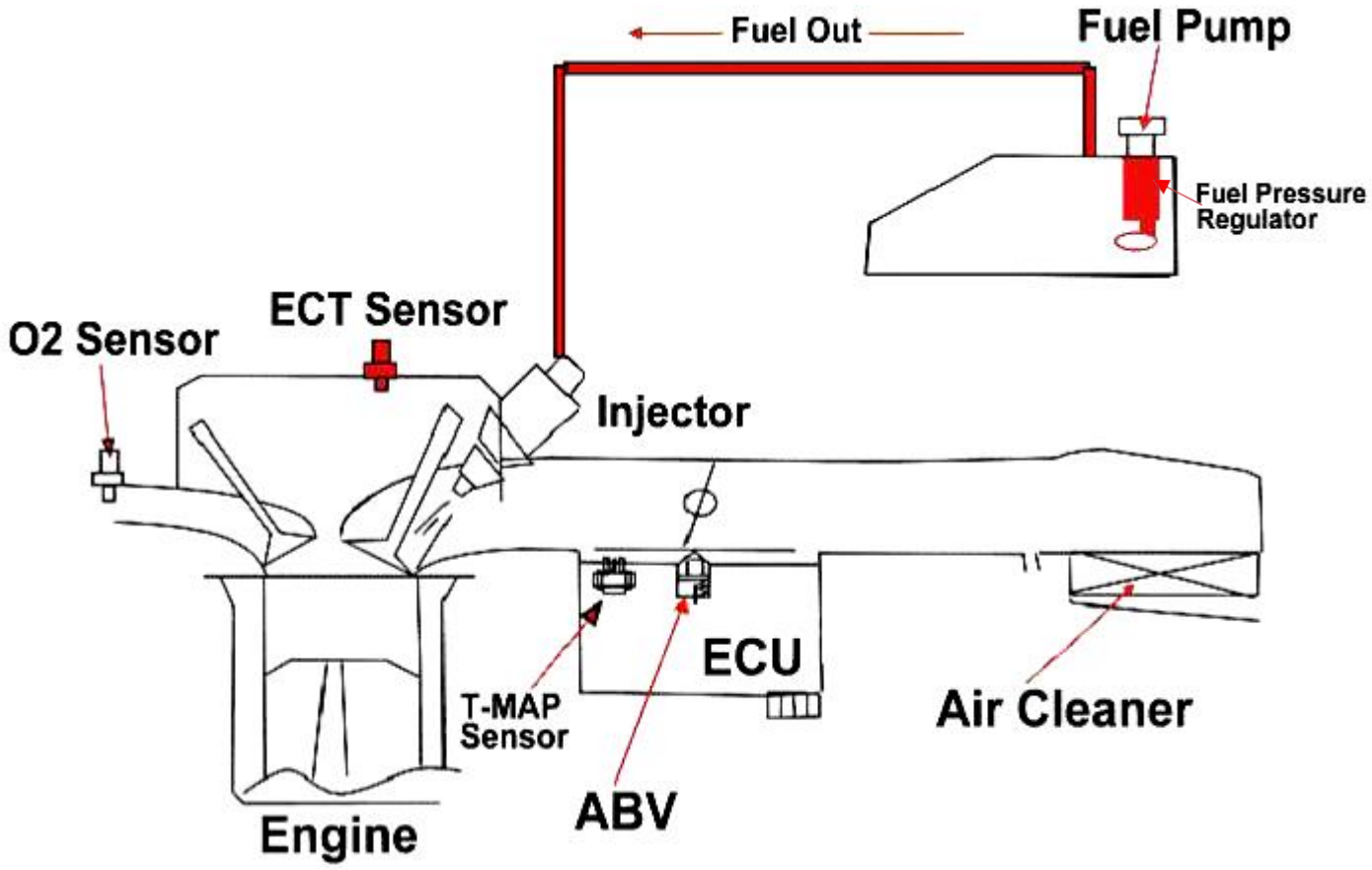
EFI System Diagram



EFi System Introduction

Based on 4-stroke SOHC engine, displacement 200 c.c. electronically controlled fuel injection. The O2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

Electronic Fuel Injection Device

Fuel supply devices: fuel tank, fuel pump, fuel filter, and fuel pressure regulator. Fuel control devices: fuel injector, and ECU.

The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe.

The fuel pressure regulator keeps the pressure around 2.5 Bar. The signals from ECU enable the injector to spray fuel into the combustion chamber once each two crankshaft-revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed inside the fuel tank to reduce the working noise, and the complicity of fuel pipes.

Electrically controlled ignition and injection system effectively reduce fuel consumption rate and pollution.

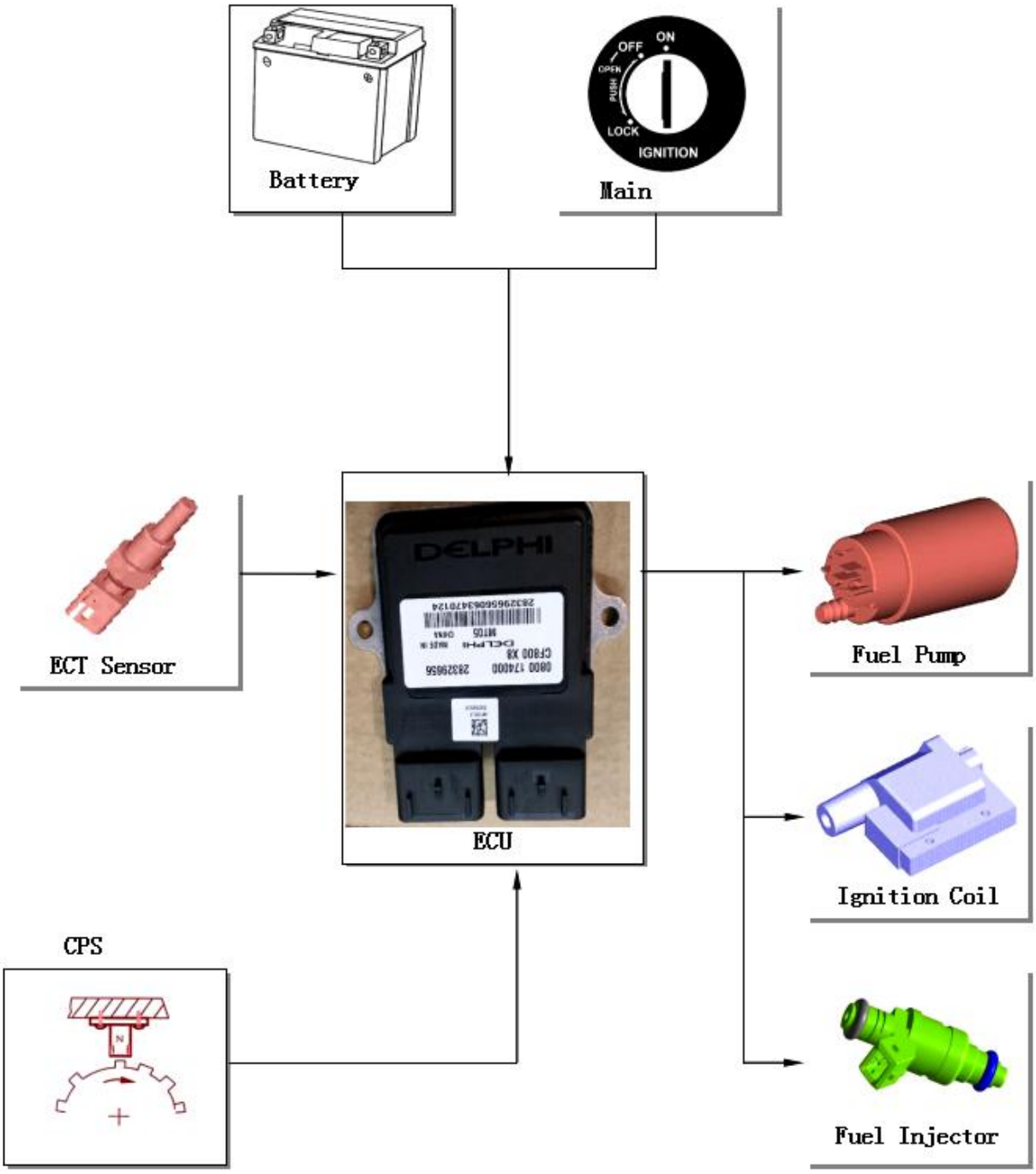
4. Fuel Injection System

In traditional gasoline engine, carburetor supplies the fuel. The process is done by the engine vacuum, and the negative pressure in the carburetor mixes fuel with air. Under this condition, three major processes are done simultaneously in the carburetor: 1. air quantity measurement, the determination of fuel quantity, the mix of fuel and air.

Electronic fuel injection system separates the three major processes into three different devices:
1. T-MAP sensor measures the air quantity and temperature and sends the signal to ECU as a reference. 2. ECU determines the amount of fuel to be injected, according to the default A/F rate.
3. ECU enables the injector to spray appropriate fuel amount. The independence of these three functions will raise the accuracy of the whole process.

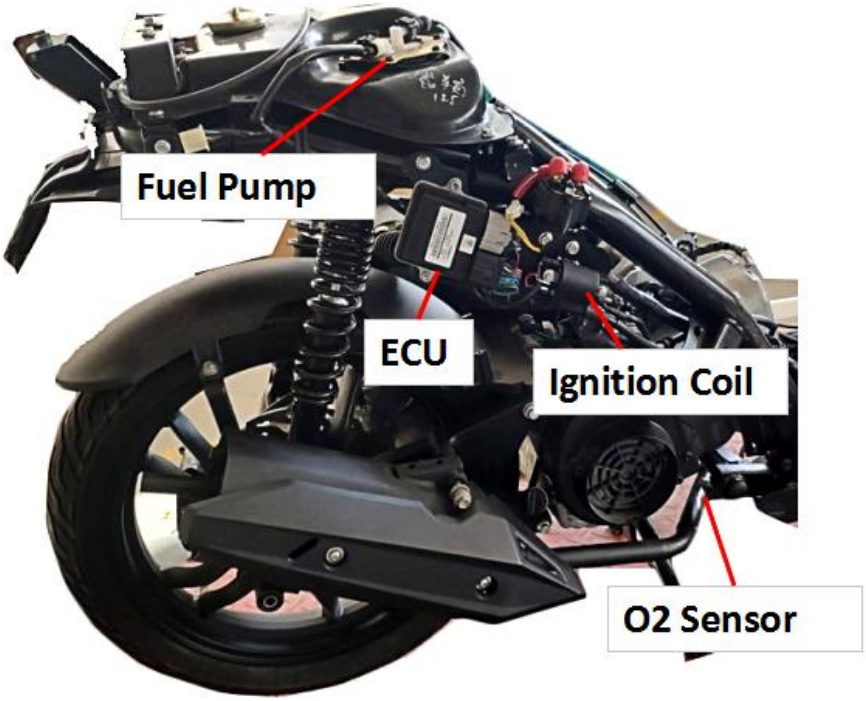
EFi engine uses computer-programmed fuel injection, the main features are:
1.The quantity of fuel injected is determined according to the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length.
2.The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3.The fuel pressure regulator maintains a 2.5 Bar pressure difference between inlet pipe and fuel pipe, raising the accuracy of fuel injection.
4.By measuring the air pressure of inlet pipe, this system gives the vehicle better accommodation to the environment.
5.Air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.

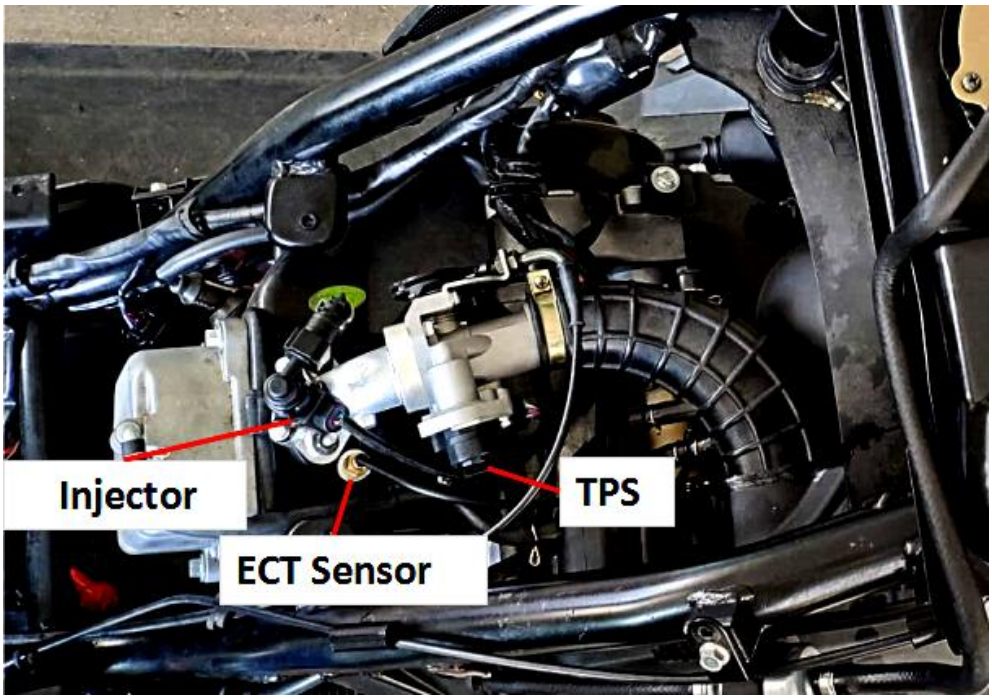
EFI System Components



4-3

EFI System Location





Precautions in Operation General information

Warning

⚠Caution

Fuel pressure release procedure:
Disconnect the fuel pump relay, switch on and press the start switch for a few seconds to crank the engine.

Specification

Item	
Idle speed	1700±100 rpm
Throttle grip free play	2~6 mm
Fuel pressure	2.5 bar

Torque value

Engine temperature sensor：0.74~0.88 kgf-m O2 sensor：3.6~4.6 kgf-m

Special tools

Injection system diagnostic tool

EFI Troubleshooting and Solution

1. Introduction`

Because of the EFI, there are many possibilities for the engine issues. In other word, one issue may be caused by the mechanical problem or the EFI components. And the diagnostic tools cannot 100% indicate the root cause. So this manual shows the way to dig out the root cause with the help of the diagnostic tools.

2. Precautions

1) Do not disassemble the components arbitrarily. It may damage the components if the water or the oil seep into the parts.

2) Turn the ignition off, before connect or disconnect the connectors.

3) Make sure the temperature of the ECU is below 80℃.

4) The fuel pressure is much high (about 250kPa), so please do not disassemble the fuel pipe arbitrarily. If have to, please release the pressure at first, and make sure the operation is delivered in the ventilated environment by the the professional maintenance persons.

5) When disassemble the fuel pump from the pump, make sure the power is off. Or it may cause the fire.

6) The fuel pump cannot work in air or water, it will shorten the service life. And the positive and negative connectors cannot be exchanged.

7) The ignition system check only could be delivered when it is necessary. When check the spark plug out of the engine, if start the engine, please make sure the throttle is closed. Or too much unburned gasoline coming to the catalyst may damage the catalyst.

8) The idle speed is adjusted by the ECU. The idle pintle is not allowed to adjust.

9) The Positive and Negative of the battery cannot be reversed. It may damage the EFI components.

10) It is forbidden to remove the battery when the engine is running.

11) Cannot measure the signal by pierce the harness.

3. Tools

1) Multimeter: Measure the voltage, the resistance and the harness connection.

2) Diagnostic tool: reading the malfcode, and engine parameters.

3) Oil pressure garage: Measure the fuel pressure.

4) Cylinder pressure garage: Measure the pressure garage.

4. Maintenance depending on the malfcode.

Description

1) If the issure cannot repeat, the issure analysis may be wrong.
2) The multimeter below means the digital type. Pointer-type is forbidden.
3) If the malfcode shows the voltage is low, it means maybe the wire is short to ground. If the malfcode shows the voltage is high, it means maybe the wire is short to battery. If the malfcode shows the components signal abnormal, it means the wire is open or short to other wires.

Diagnostic help：

1) If the malfcode shows again after clearance, check whether the connector is connected well.
2) Do not ignore the affect of the engine maintenance situation, the cylinder pressure, and the mechanical ignition timing.
3) Change another ECU to do the test. If the malfcode disappears, the root cause is the ECU. If the malfcode is still there, then use the old ECU to do the test.
4) Malfcode：P0107
5) Information：MAP Circuit Low Voltage or Open

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Check the data of 'BARO'. Make sure whether it is about 100kPa (depending on where you are)	Yes	Step 5
		No	next
3	Remove the connector, and use the multimeter to check whether the voltage between pin B and D is about 5V.	Yes	Step 5
		No	Next
4	Check whether the following pins is short to ground: J2-11, J2-10, J2-16 of the ECU and pin A, D, B of the connector.	Yes	Check the harness
		No	Next
5	Crank the engine to stay at idle. Check whether the MAP is about 30-50kPa. Then go to WOT, check whether the MAP goes to about 90kPa.	Yes	Diagnostic help
		No	Change the sensor

Malfcode：P0108

Information：MAP Circuit High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Check the data of 'BARO'. Make sure whether it is about 100kPa (depending on where you are)	Yes	Step 5
		No	next
3	Remove the connector, and use the multimeter to check whether the voltage between pin B and D is about 5V.	Yes	Step 5
		No	Next
4	Check whether the following pins is short to battery: J2-11, J2-10, J2-16 of the ECU and pin A, D, B of the connector.	Yes	Check the harness
		No	Next
5	Crank the engine to stay at idle. Check whether the MAP is about 30-50kPa. Then go to WOT, check whether the MAP goes to about 90kPa.	Yes	Diagnostic help
		No	Change the sensor

Malfcode：P0112

Information：IAT Circuit Low Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		NEXT STEP
2	check whether the data of 'intake air temperature' equals to the real intake air temperature.	Yes	Step 5
		No	Next
3	Remove the connector, and use the multimeter to check whether the resistance between pin B and D is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Remove the connector and check whether the voltage between pin B and D is about 5V.	Yes	Next
		No	Check harness
5	Check whether the following pins are short battery: J2-8, J2-10 of the ECU and pin C, D of the	Yes	Change the harness
		No	Next

	connector.		
6	Crank the engine and stay idle. Check whether the 'intake air temperature' goes up when the engine temperature goes up.	Yes	Help
		No	Change the sensor.

Malfcode：P0113

Information：IAT Circuit High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	check whether the data of 'intake air temperature' equals to the real intake air temperature.	Yes	Step 5
		No	Next
3	Remove the connector, and use the multimeter to check whether the resistance between pin B and D is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Remove the connector and check whether the voltage between pin B and D is about 5V.	Yes	Next
		No	Check harness
5	Check whether the following pins are short to ground or open: J2-8, J2-10 of the ECU and pin C, D of the connector.	Yes	Change the harness
		No	Next
6	Crank the engine and stay idle. Check whether the 'intake air temperature' goes up when the engine temperature goes up.	Yes	Help
		No	Change the sensor.

Malfcode：P0117

Information：Coolant/Oil Temperature Sensor Circuit Low Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next

2	check whether the data of 'engine temperature' equals to the real temperature.	Yes	Step 5
		No	Next
3	Remove the connector and use the multimeter to check whether the resistance between pin A and C of the sensor is reasonable according to the temperature.	Yes	Step 5
		No	Next
4	Use the multimeter to measure whether the voltage between A and C is about 5V.	Yes	Next
		No	Check the harness
5	check whether the following pins are short to ground or open: J2-10, J2-14 of the ECU and pin C and D of the sensor.	Yes	Harness issue
		No	Next
6	Use multimeter to check whether the voltage between pin A and B is about 5V.	Yes	Help
		No	Step 5

Malfcode：P0131/P0132

Information：O2S 1 Circuit Low/High Voltage

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Use multimeter to check whether the connection between pin B of the oxygen sensor and pin J2-17 of the ECU is open, and whether the pin B of sensor is short to pin A.	Yes	Harness issue
		No	Next
3	Crank the engine and stay idle. When the engine gets warm, use multimeter to check whether the voltage between pin A and B keeps jumping between 100-900mV.	Yes	Help
		No	Next
4	A、emission pipe: block/leakage or not. B、injector: leakage or not C、fuel pressure too big or not D、 valve clearance is to small or not	Yes	Engine maintenance
		No	Change sensor

Malfcode：P0201

Information：Injector 1 Circuit Malfunction

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Remove the connector of injector 1, use multimeter to check whether the voltage of Pin A is about 12V.	Yes	Step 4
		No	Next
3	Check whether the connection between pin A and the main power relay is short to ground or open.	Yes	Harness issue
		No	Next
4	Use multimeter to measure whether the resistance between pin A and B of the injector is about 10-14Ω @ 20℃	No	Change the injector
		Yes	next
5	Use the multimeter to check whether the voltage of Pin B is about 12V.	Yes	Help
		No	Next
6	Check whether the connection between pin B of the injector and J2-05 of the ECU is open or short to battery/ground.	Yes	Harness issue
		No	Help

Malfcode：P0230/P0232

Information：FPR Coil Circuit Low/High Voltage or Open

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition off		next
2	Wait about 30s. Remove the fuel pump relay, ignition on. Check whether voltage of the relay feeder ear is about 12V	Yes	Change the pump
		No	Next
3	Check whether the feeder ear is short to ground or open.	Yes	Harness issue
		No	Help

Malfcode：P0351

Information：Cylinder 1 Ignition Coil Malfunction

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition on.		next
2	Remove the connector and check whether the voltage of pin + is about 12V.	Yes	Step 4
		No	Next
3	Check whether the connection of the pin + and main power relay is open or short to ground.	Yes	Harness issue
		No	Next
4	Use multimeter to check whether the resistance of the two coil pins is 0.5-0.65Ω @20℃	Yes	Change coil
		No	Next
5	Use multimeter to check whether the voltage of pin B is about 12V.	Yes	Help
		No	Next
6	Check whether the connection of pin 2 of the coil and J2-01 of ECU is open or short to battery/ground.	Yes	Harness issue
		No	Help

Malfcode：P0505

Information：Idle Speed Control Error

ITEM	OPERATION	RESULT	NEXT STEP
1	Connect the diagnostic tool, and ignition off		next
2	Remove the connector. Use multimeter to check whether the resistance between pin A and pin D, pin B and pin C is about 53±5.3Ω	Yes	Next
		No	Change stepper motor
3	Check whether the 4 wires are short to battery/ground or open.	Yes	Harness issue
		No	Help

5. Maintenance depending on the performance.

Before issue analysis, please check:

1) The MIL works well.

2) Clear the history malfcode.

3) When the malfcode comes again, note the conditions.

Check the appearance

1) Whether there is leakage of the fuel pipe or not.

2) Whether there is block/leakage or damage of the intake pipe.

3) Aging level of the high-voltage cable.

4) Whether the ground connection is strong enough.

5) All the connectors connected well.

Note: if any item above exists, please do the fix it at first before issue analysis.

Diagnostic Help：

1) Make sure there is no any issue record of the engine.

2) Make sure the issue could repeat.

3) Have checked follow the instructions above and no cause found.

4) Do not ignore the maintenance situation, cylinder pressure, mechanical timing and fuel quality.

5) Change the ECU and repeat the test, if the issue is gone, then the root cause is the ECU. Or change the old one back to check the root cause.

6) Engine cannot start

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the voltage of the battery is around 8-12V.	Yes	Next
		No	Change the battery.
2	Crank the engine, and check whether the voltage is above 8V.	Yes	Next
		No	Change the battery.
3	Check whether the start motor working well or not.	Yes	Next
		No	Change the start motor.
4	If the issue only occurs in winter, check the oil and gear box oil.	Yes	Change the oil
		No	Next
5	Check whether the engine rotation resistance is too big or not.	Yes	Check the engine
		No	Help

ITEM	OPERATION	RESULT	NEXT STEP
1	Check weather the fuel pump pressure is about	Yes	Next

	250kPa at idle.	No	Check the pump.
2	Check whether the 'RMP' data on the diagnostic tool shows the real engine RPM.	Yes	Next
		No	Check the crank sensor.
3	Pull out the spark plug, check whether the spark over is normal.	Yes	Next
		No	Check the ignition system
4	Check whether the cylinder pressure is normal.	Yes	Engine is good.
		No	Check the engine

7) Start Difficult.

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the fuel pump pressure is about 250kPa at idle.	Yes	Next
		No	Check the pump.
2	Pull out the spark plug, check whether the spark over is normal.	Yes	Next
		No	Check the ignition system
3	Remove the connector of the engine temperature sensor, and check whether the engine start well.	Yes	Check the engine temperature sensor
		No	Next
4	With a little bigger throttle, check whether the engine starts well.	Yes	Clean the throttle body and bypass channel.
		No	Next
5	Pull out the injector, and crank the engine. Check whether the injection is normal.	Yes	Next
		No	Clean or change the injector.
6	Pull out the spark plug, check whether it is wet or not	Yes	dry the plug and combustion chamber.
		No	Next
7	Check whether the cylinder pressure is normal or not	Yes	Engine is good
		No	Check the engine

- Unstable idle

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the air filter is blocked and whether the intake pipe leaks.	Yes	Intake system maintenance
		No	Next
2	Whether there is carbon deposit at the throttle body and bypass channel.	Yes	Clean the TB
		No	Next
3	Check whether the IACV works well	Yes	Next
		No	Check the IACV
4	Check whether the fuel pressure is about 250kPa.	Yes	Next
		No	Check the pump
5	Check whether the injector is blocked.	Yes	Clean or change the injector
		No	Next
6	Make sue using the right type spark plug	Yes	Next
		No	Change the spark plug
7	Check whether the cylinder pressure is normal	Yes	Next
		No	Check the engine
8	Remove the engine temperature sensor, and check whether the engine works well	Yes	Change the senor
		No	Next
9	Remove the TPS, check whether the engine works well	Yes	Change the sensor
		No	Help

- High idle

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the throttle cable is stuck	Yes	Adjust the cable
		No	Next
2	Check whether the idle pintle has been adjusted	Yes	Change the TB
		No	Next

3	Check whether there is any leakage of the intake pipe.	Yes	Maintenance
		No	Next
4	Check whether the IACV works well	Yes	Next
		No	Change IACV
5	Remove the engine temperature sensor and check whether the engine works well	Yes	Help
		No	Change the sensor

- Acceleration gets worse

ITEM	OPERATION	RESULT	NEXT STEP
1	Check whether the air filter is blocked and whether the intake pipe leaks.	Yes	Intake system maintenance
		No	Next
2	Check whether the fuel pressure is about 250kPa.	Yes	Next
		No	Check the pump
3	Pull out the spark plug, check whether it is wet or not	Yes	dry the plug and combustion chamber.
		No	Next
4	Check whether the TMAP, TPS and the connections works well.	Yes	Next
		No	Change the sensor or harness maintenance
5	Check whether the injector is blocked.	Yes	Clean or change the injector
		No	Next
6	Check the type and the clearance of the spark plug.	Yes	Next
		No	Change the spark plug
7	Check whether the cylinder pressure is normal	Yes	Next
		No	Check the engine
8	Check whether the exhaust pipe is blocked or not	No	help
		Yes	maintenance

- Backfire

ITEM	OPERATION	RESULT	NEXT STEP
1	Pull out the spark plug, check whether the spark over is normal.	Yes	Next
		No	Check the ignition system
2	Check whether the timing is right	Yes	Next
		No	Adjust the timing
3	Check whether there is leakage of the valve	Yes	Adjust the valve
		No	Next
4	Check whether the injector is blocked.	Yes	Clean or change the injector
		No	Next
5	Check whether the oxygen sensor works well	Yes	Help
		No	Change the sensor

- Miss fire

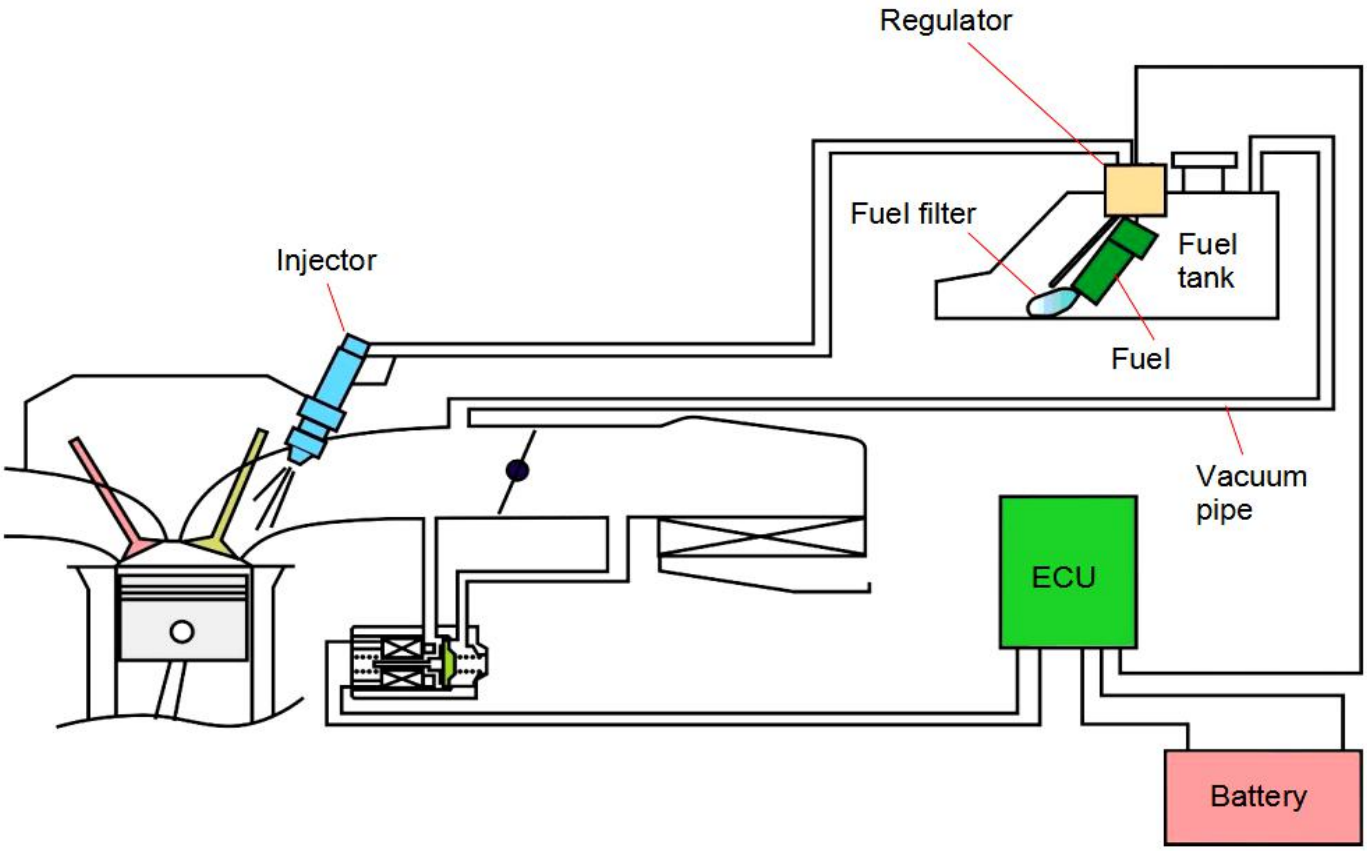
Serial number	DTC number	DEC number	DTC Description	ISO-15031-6-2013/SAE-J2012-2013comment
1	P0118	280	CLTD_CoolantShortHigh	Engine Coolant Temperature Sensor 1 Circuit High
2	P0117	279	CLTD_CoolantShortLow	Engine Coolant Temperature Sensor 1 Circuit Low
3	P0116	278	CLTD_CoolantStuck	Engine Coolant Temperature Sensor 1 Circuit Range/Performance
4	P1116	4374	CLTD_HighAtStartup	Manufacturer Controlled DTC: Engine Coolant Temperature Sensor 1 Circuit Range/Performance
5	P0336	822	CrankNoisySignal	Crankshaft Position Sensor "A" Circuit Range/Performance
6	P0335	821	CrankNoSignal	Crankshaft Position Sensor "A" Circuit
7	P2301	8961	EST_A_ShortHigh	Ignition Coil "A" Primary Control Circuit High

8	P 2300	8960	EST_A_ShortLow	Ignition Coil "A" Primary Control Circuit Low
9	P 2304	8964	EST_B_ShortHigh	Ignition Coil "B" Primary Control Circuit High
10	P 2303	8963	EST_B_ShortLow	Ignition Coil "B" Primary Control Circuit Low
11	P 0123	291	TPS_Short_High	Throttle/Pedal Position Sensor/Switch "A" Circuit High
12	P 0122	290	TPS_Short_Low	Throttle/Pedal Position Sensor/Switch "A" Circuit Low
13	P 0459	1113	CCP_CircuitShortHigh	EVAP System Purge Control Valve "A" Circuit High
14	P 0458	1112	CCP_CircuitShortLow	EVAP System Purge Control Valve "A" Circuit Low
15	P 2A00	10752	EXSD_11_TimeToActivity	O2 Sensor Circuit Range/Performance Bank 1 Sensor 1
16	P 00D1	209	EXSD_11_Underheat	HO2S Heater Resistance Bank 1 Sensor 1
17	P 2A03	10755	EXSD_21_TimeToActivity	O2 Sensor Circuit Range/Performance Bank 2 Sensor 1
18	P 00D7	215	EXSD_21_Underheat	HO2S Heater Resistance Bank 2 Sensor 1
19	P 0232	562	FPP_CircuitShortHigh	
20	P 0231	561	FPP_CircuitShortLow	
21	P 014D	333	EXSD_RSP_11_LtoR_Rate	O2 Sensor Slow Response - Lean to Rich Bank 1 Sensor 1
22	P 014C	332	EXSD_RSP_11_RtoL_Rate	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 1
23			EXSD_RSP_11_LtoR_Rate	O2 Sensor Slow Response - Lean to Rich Bank 2 Sensor 1
24			EXSD_RSP_11_RtoL_Rate	O2 Sensor Slow Response - Rich to Lean Bank 2 Sensor 1
25	P 0601	1537	FILE_ROM_Checksum	Internal Control Module Memory Checksum Error
26	P 0262	610	Inj_Cyl_1_ShortHigh	Cylinder 1 Injector "A" Circuit High
27	P	609	Inj_Cyl_1_ShortLow	Cylinder 1 Injector "A" Circuit Low

	0261			
28	P 0265	613	Inj_Cyl_2_ShortHigh	Cylinder 1 Injector "B" Circuit High
29	P 0264	612	Inj_Cyl_2_ShortLow	Cylinder 1 Injector "B" Circuit Low
30	P 3106	12500	IPSD_MAP_PwrLoTPS_Rationality	Manufacturer Controlled DTC
31	P 0108	264	IPSD_MAP_Short_Hi	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit High
32	P 0107	263	IPSD_MAP_Short_Lo	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Low
33	P 0105	261	IPSD_MAP_Stuck	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit
34	P 0109	265	IPSD_MAP_Erratic	Manifold Absolute Pressure/Barometric Pressure Sensor Circuit Intermittent
35	P 0114	276	ITSD_TOT_ERRATIC	Intake Air Temperature Sensor 1 Circuit Intermittent Bank 1
36	P 0113	275	ITSD_TOT_HIGH_HI	Intake Air Temperature Sensor 1 Circuit High Bank 1
37	P 0112	274	ITSD_TOT_HIGH_LO	Intake Air Temperature Sensor 1 Circuit Low Bank 1
38	P 0111	273	ITSD_TOT_STUCK	Intake Air Temperature Sensor 1 Circuit Range/Performance Bank 1
39	P 0650	1616	MIL_Circuit	
40	P 2195	8597	O2_11_LeanPE	O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1
41	P 2196	8598	O2_11_RichDFCO	O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1
42	P 2197	8599	O2_21_LeanPE	O2 Sensor Signal Biased/Stuck Lean Bank 2 Sensor 1
43	P 2198	8600	O2_21_RichDFCO	O2 Sensor Signal Biased/Stuck Rich Bank 2 Sensor 1
44	P	306	O2_11_ShortHigh	O2 Sensor Circuit High Voltage Bank 1 Sensor 1

	0132			
45	P 0131	305	O2_11_ShortLow	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
46	P 0301	769	MisfireCyl_1	Cylinder 1 Misfire Detected
47	P 0302	770	MisfireCyl_2	Cylinder 2 Misfire Detected
48	P 0031	49	O2_HeaterShortLow	HO2S Heater Control Circuit Low Bank 1 Sensor 1
49	P 0032	50	O2_HeaterShortHigh	HO2S Heater Control Circuit High Bank 1 Sensor 1
50	P 0138	312	O2_21_ShortHigh	O2 Sensor Circuit High Voltage Bank 2 Sensor 1
51	P 0137	311	O2_21_ShortLow	O2 Sensor Circuit Low Voltage Bank 2 Sensor 1
52	P 0037	55	O2_2_HeaterShortLow	HO2S Heater Control Circuit Low Bank 2 Sensor 1
53	P 0038	56	O2_2_HeaterShortHigh	HO2S Heater Control Circuit High Bank 2 Sensor 1
54	P 0563	1379	SysVoltHigh	System Voltage High
55	P 0562	1378	SysVoltLow	System Voltage Low
56	P 0500	1280	VSS_NoSignal	Vehicle Speed Sensor "A" Circuit
57	P 2257	8791	Secondary Air Injection System Circuit Low	
58	P 2258	8792	Secondary Air Injection System Circuit High	
59	P 0850	2128	PrkNtrlSwitch	
60	P 1693	5799	TAC_Fault_Low	
61	P 1694	5780	TAC_Fault_High	
62	P 0505	1285	IdleControl	

Fuel Lines



System description:

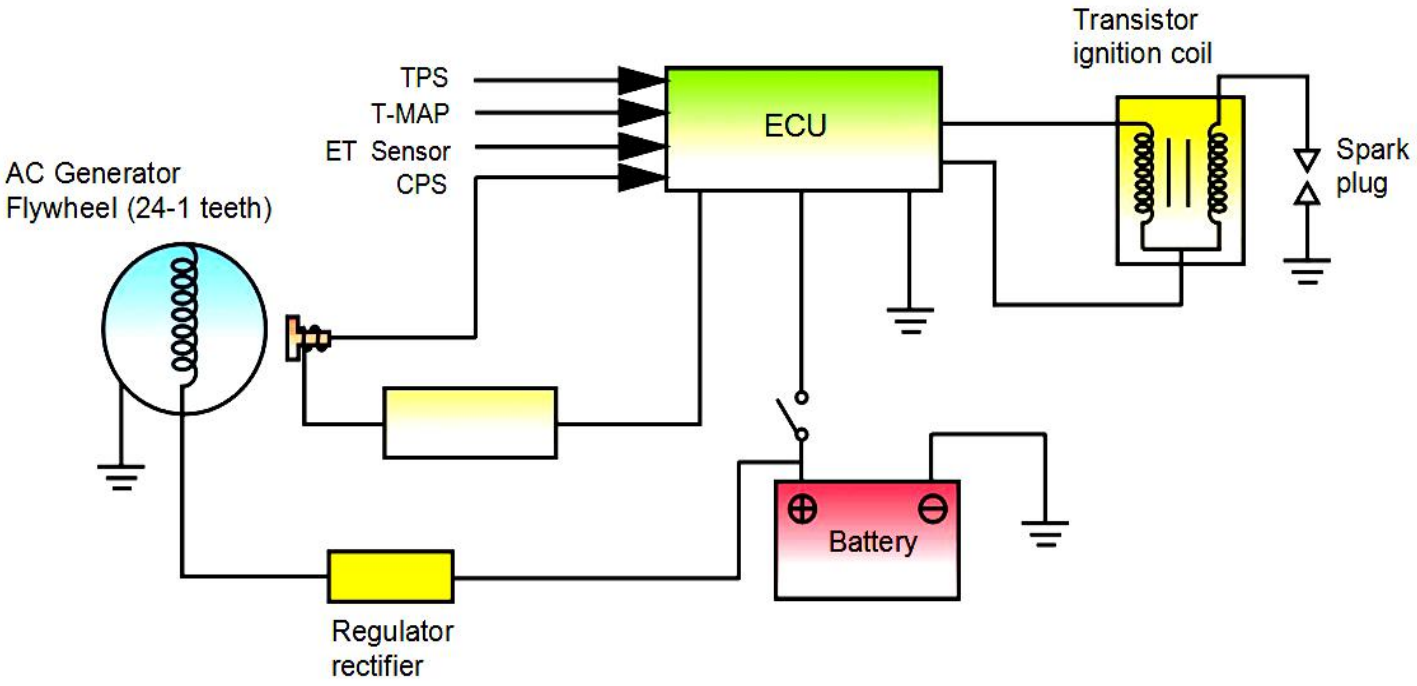
1. After key-on, all sensors' signals sent to the ECU first. The electrical fuel pump will be activated by ECU signal. If the engine did not start for 2~3 seconds, then the fuel pump will be turned off to save electricity. The pressure regulator maintains the fuel pressure around

2.5 Bar, and the fuel injector spray proper fuel quantity according to the conditions and environmental coefficient. When key-off or engine stopped, the fuel pumps stop operating.

2.The fuel filter is to filter alien materials so it has to be replaced regularly.

3.Do not let the starting motor keep running when the engine cannot start. It will cause battery voltage to decrease. If the voltage drops under 8V, the pump will not operate. The countermeasure will be starting the engine by connecting a new battery or with kick-starter.

Ignition System



Principle of operation

The engine is equipped with a computerized ignition control system that collects signals from CPS, TPS, ET Sensor, and T-MAP Sensor. Then, correspondence with engine RPM, this

8-bit microcomputer in the system controls ignition timing properly. The secondary coil creates 25000~30000V high voltage to ignite the spark plug by means of the transistor operation of the primary current entry from the ECU. This can maximize engine performance and also decrease fuel consumption.

Specification

1.Ignition timing: BTDC 10°/ 1700RPM

2.Spark plug: NGK CR7HSA Gap: 0.8mm

3.CPS pulse generator coil: 80~160Ω / 20ºC (G/W-LY)

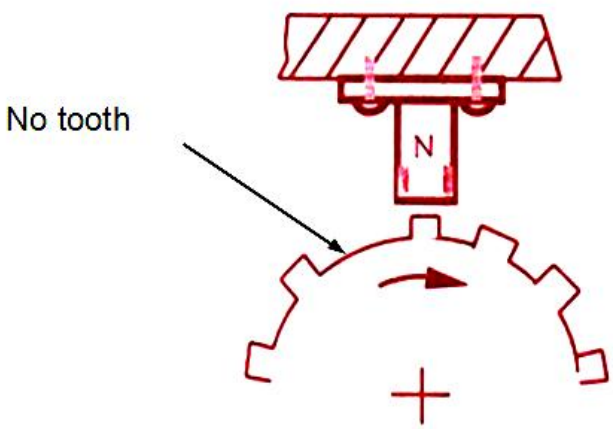
4.Ignition coil

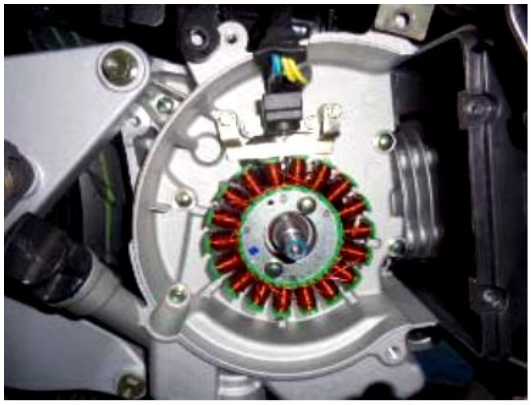
Primary circuit：0.63±0.03Ω (23ºC)

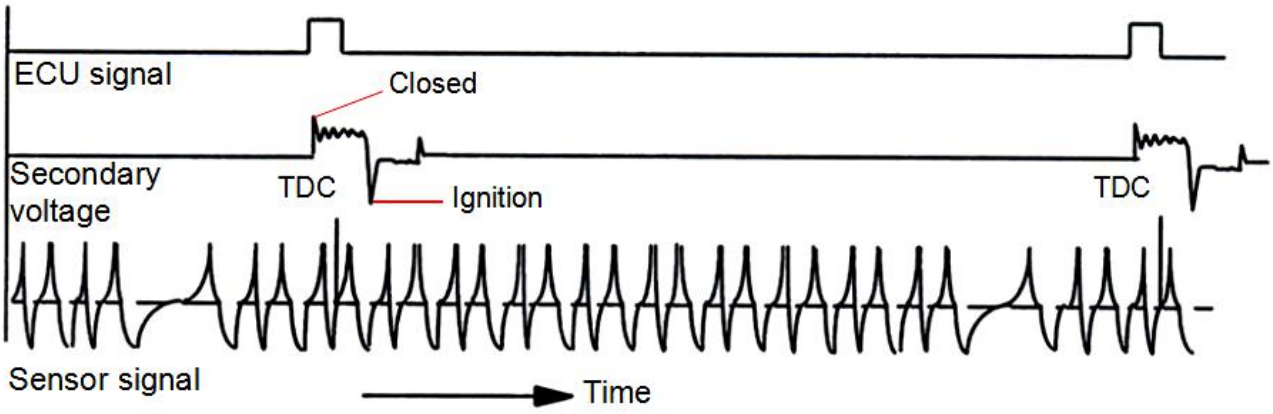
5.Battery:

Capacity: 12 V 6Ah

Crankshaft Position Sensor





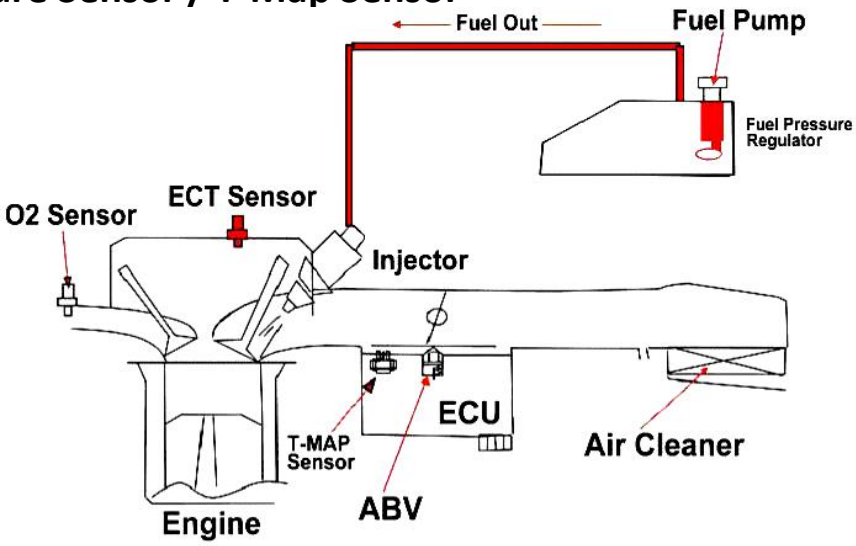


Description:

The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (24-1 tooth).

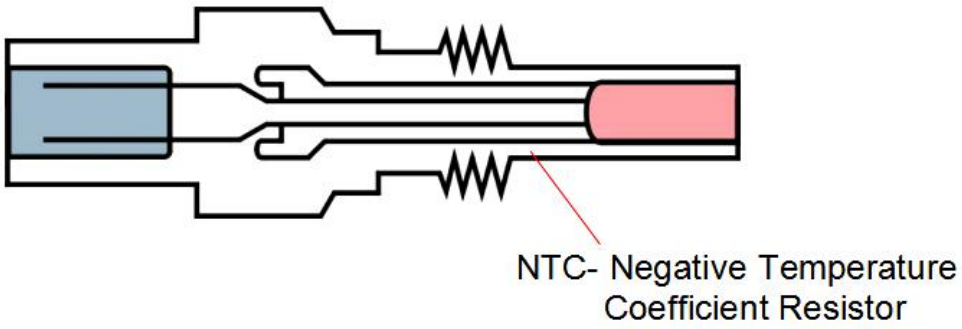
There is one tooth every 15 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.

Engine Temperature Sensor / T-Map Sensor



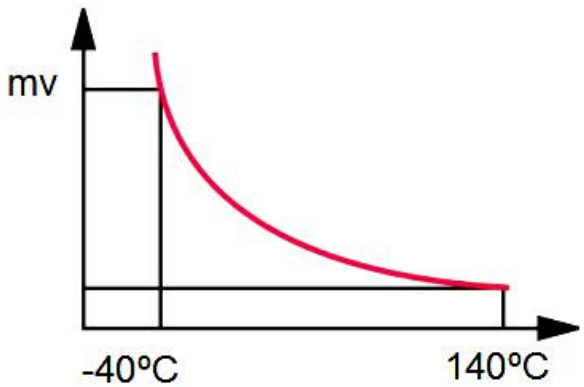
Engine temperature sensor:

According to the semiconductor's characteristic, the sensor detects the temperature of engine oil and metal parts and then sends a voltage signal to the ECU. On this base, the ECU can correct fuel injection and ignition timing.

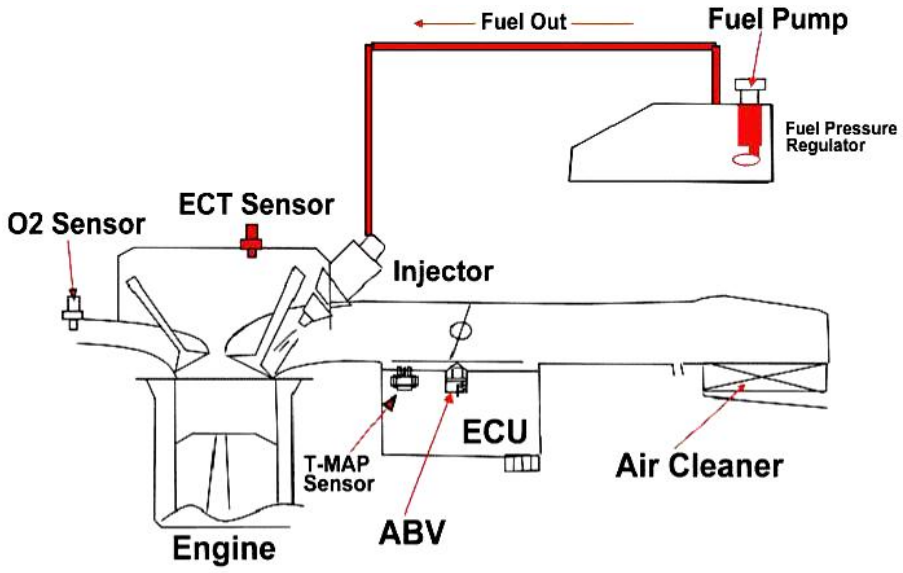


T-MAP Sensor：

Sensor combined both pressure and NTC can detect the absolute pressure and temperature in the intake manifold, and then provides the ECU with signal for adjustment fuel injection quantity based on environmental temperature and air pressure difference from elevation level change.



Air By-pass Valve



Description:

ECU receives all sensors' signals to control the throttle valve openness with PWM, and adjust airflow through the by-pass valve of the intake manifold. It can adjust idle speed for a stably running engine.

1.When engine cold starting---the by-pass valve open for a while to increase airflow and to stabilize engine idle speed within initial starting
2.Warm-up---when engine oil is in low temperature condition, the by-pass valve adjusts airflow according to engine temperature (engine oil temperature), and raises idle speed.
3.Speed decreasing--- ECU controls the by-pass valve in correspondence with throttle operation, to provide inlet pipe with proper airflow quantity. Such operation will smooth the engine rpm reduction process, preventing the engine from stalling, excessive negative pressure, and also reduce HC emission.

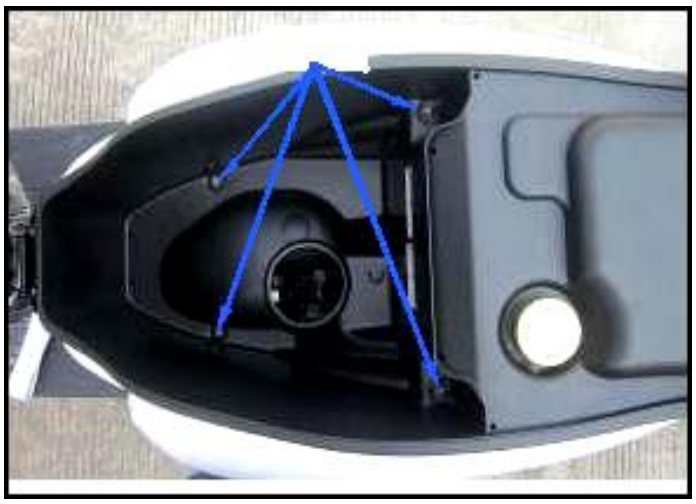
Fuel Injector

The injector provides intake valve a fuel jet. This can reduce the pollution of HC. The shortened version of fuel pump plate makes its size more compact, and sturdier against shocks. ECU signal controls the regulator to maintain 2.5 bars between the fuel pressure and the air pressure of inlet pipe. Through controlling the time length of injection under steady fuel pressure, the system can optimize the fuel injection quantity according to different engine workloads.

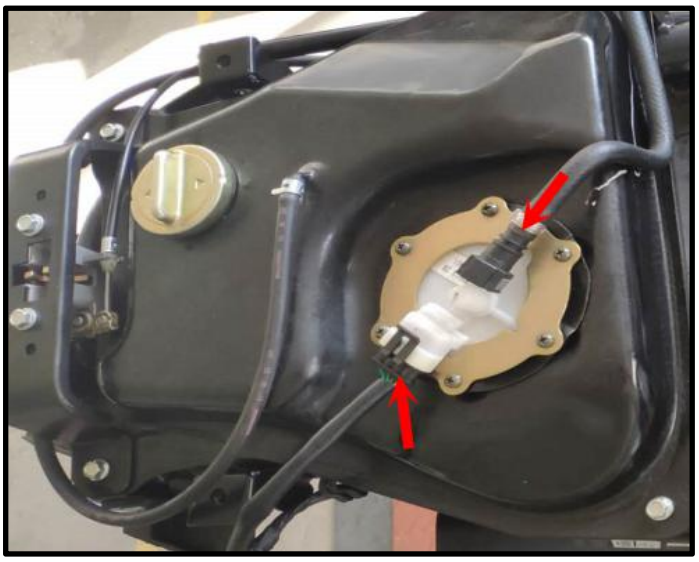
Fuel Pump

Electrical fuel pump is mounted inside the fuel tank. The power source is DC current provided and controlled by ECU; the pump can provide 14L/hour under the pressure of 2.5 bars.

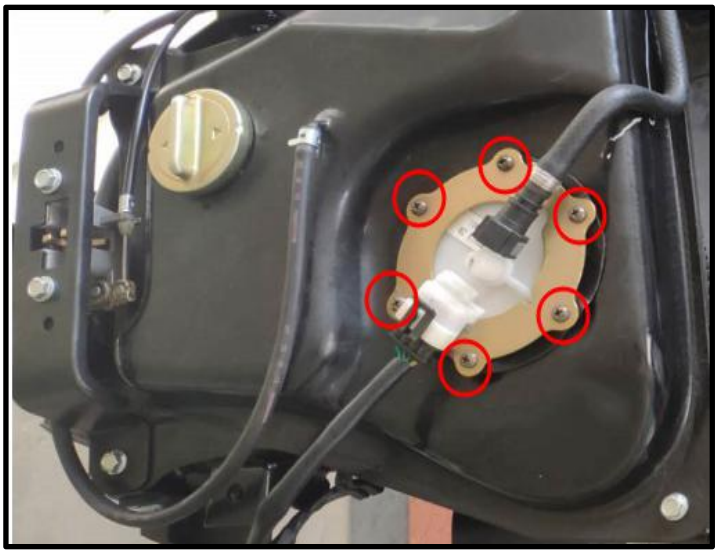
Fuel Pump / Fuel Unit
Removal
Removal
Open the seat.
Remove 4 bolts in the front of the luggage box.



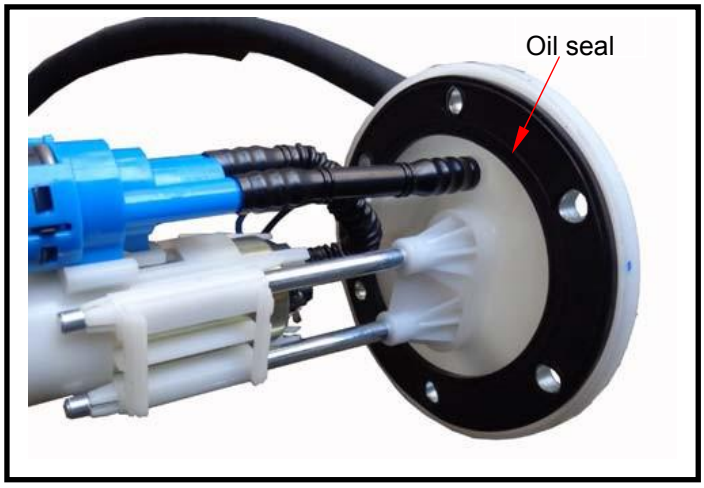
Disconnect the fuel pump couplers.
Disconnect the fuel unit couplers Remove the fuel pipes.



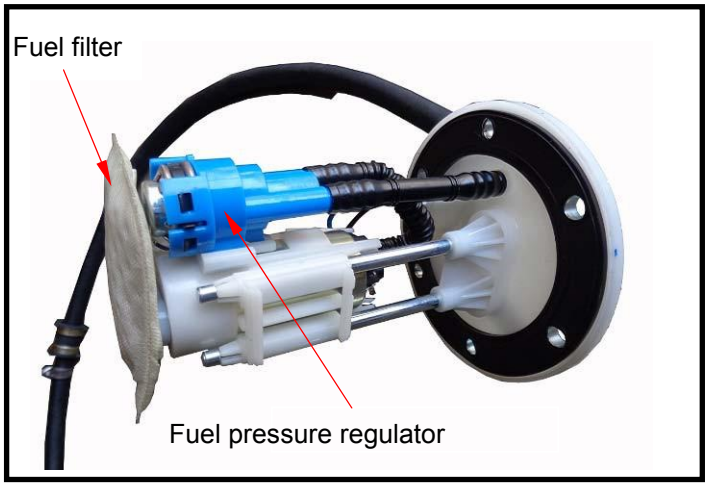
Remove the fuel pump lock bolts.



Remove the fuel pump and fuel unit.



Check if the fuel filter is contaminated or clogged. Replace it with new one if necessary.



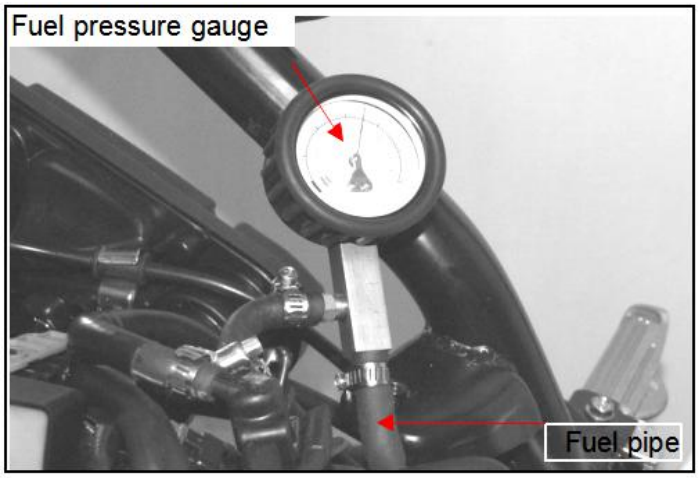
Installation

Install in the reverse order of removal.

⚠ Caution

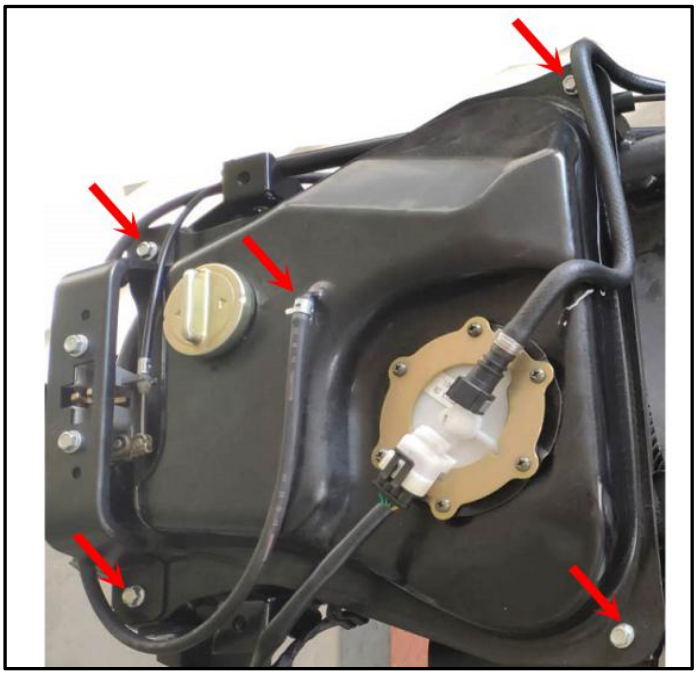
- Do not bend the fuel unit float arm
- Do not fill out too much fuel in the tank.
- Align the assembly mark when installing the fuel pump and fuel unit.
- Replace the oil seal if any damage or deformation is found.

Inspection：
Disconnect the fuel pipe from the fuel injector.
Connect the fuel pressure gauge to check



⚠ Caution
●Make sure the fuel pressure is normal (2.5 bar).
●Always release the fuel pressure before removing the fuel pipe to prevent the fuel from splashing.

Special tool：
Replace the fuel pump with new one if malfunction is confirmed.



Fuel Tank
Removal
Disconnect the fuel pump and the fuel unit coupler.
Remove fuel pipe.
Remove the fuel cut valve pipe. Remove the fuel tank (4 lock bolts).

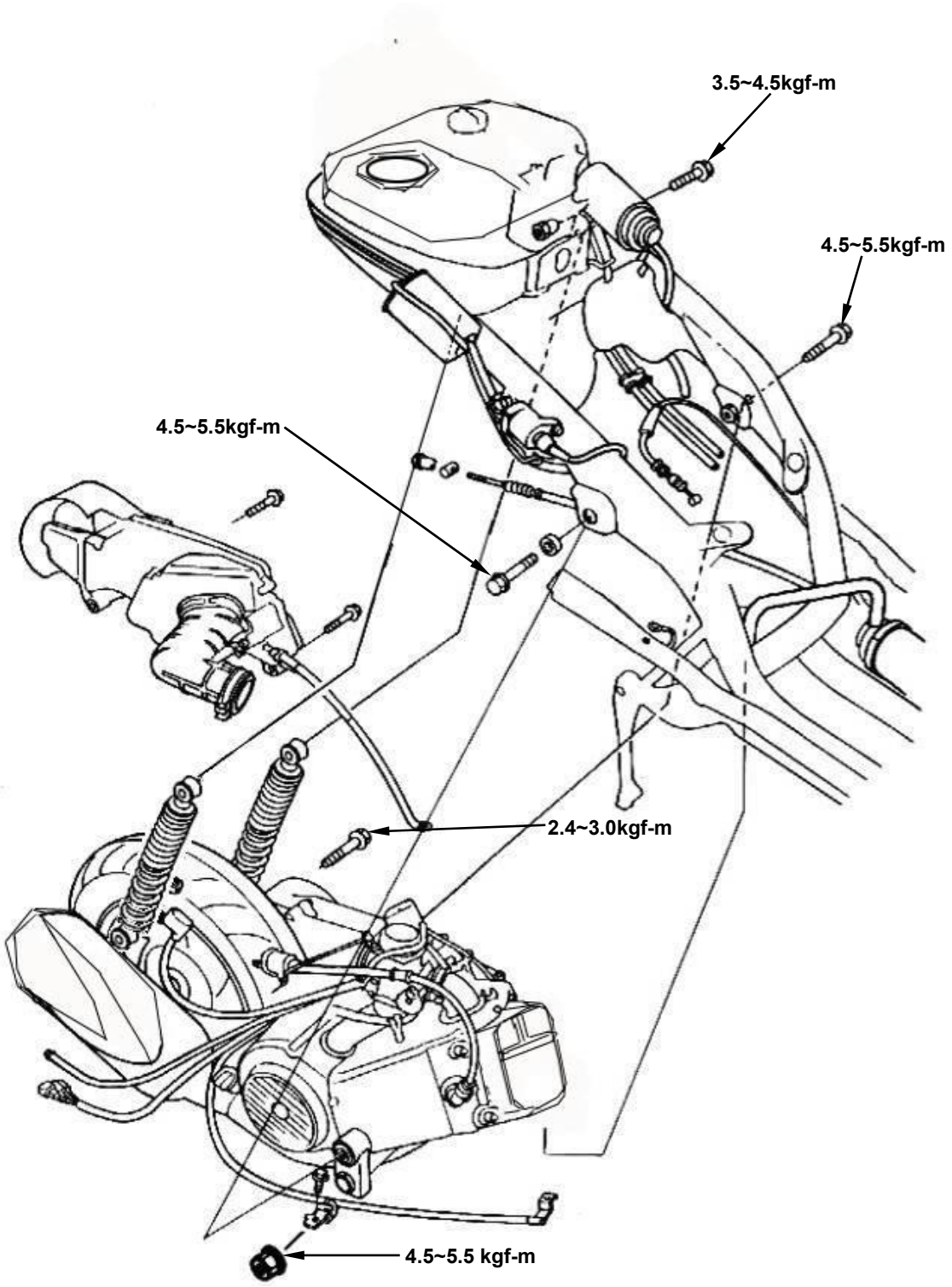
Installation
Install in the reverse order of removal.

⚠ Caution
● Make sure the fuel in the tank is not too much before removing the fuel tank.
● Replace the fuel tank if there is any damage or leakage.

5. REMOVAL OF ENGINE

CONTENTS

MECHANISM DIAGRAM



5. REMOVAL OF ENGINE

OPERATIONAL PRECAUTIONS

General Information

- Engine must be supported by a bracket or adjustable tool in height.
- The following parts can be serviced with the engine installed on the frame.
  1. Carburetor
  2. Driving disk, driving belt, clutch, and transporting disk
  3. Final reduction gear mechanism

Specification

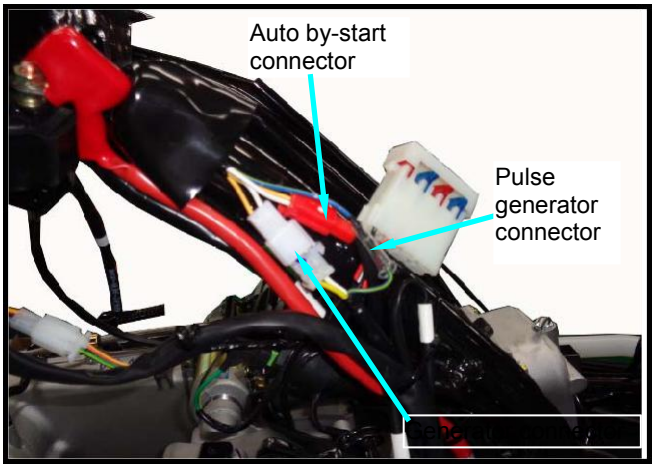
Item		Specification
Engine Oil Capacity	Replacement	900 c.c.
	Disassemble	800 c.c.
Gear Oil Capacity	Replacement	130 c.c.
	Disassemble	120 c.c.

Torque Values

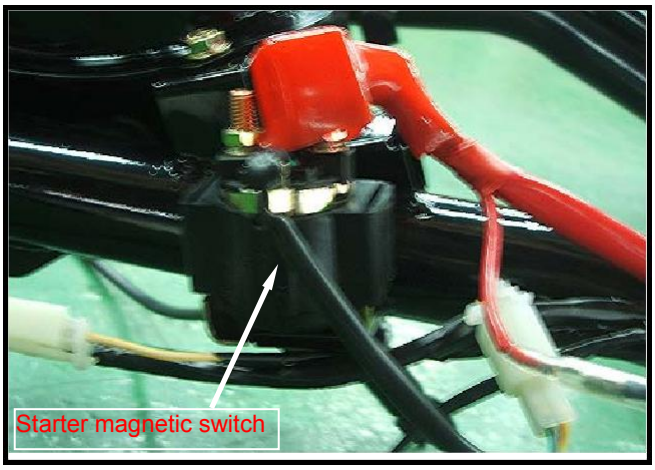
Engine suspension bolt (frame side)	4.5~5.5kgf-m
Engine suspension nut (engine side)	4.5~5.5kgf-m
Bolt of rear shock absorber upper connection	3.5~4.5kgf-m
Bolt of rear shock absorber lower connection	2.4~3.0kgf-m

ENGINE REMOVAL

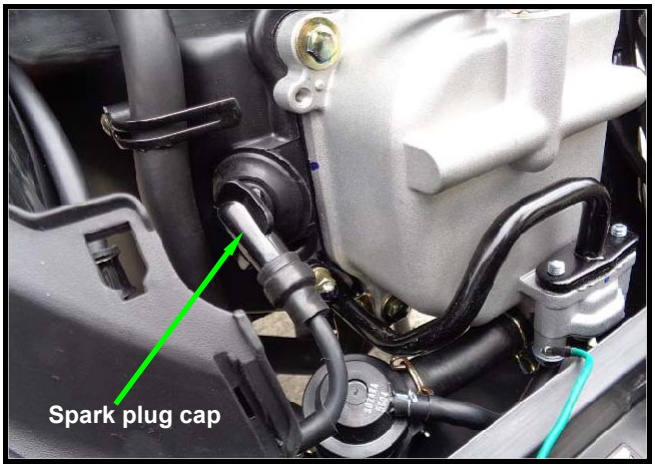
Open the seat.
Remove the rear carrier (3 bolts).
Remove the luggage box assembly (4 bolts).
Remove the body cover (4 screws, 3 bolts).
Remove the power connector of auto by-start.
Remove the generator connector and pulse generator connector.



Remove the starter motor wire on the Starter magnetic switch.



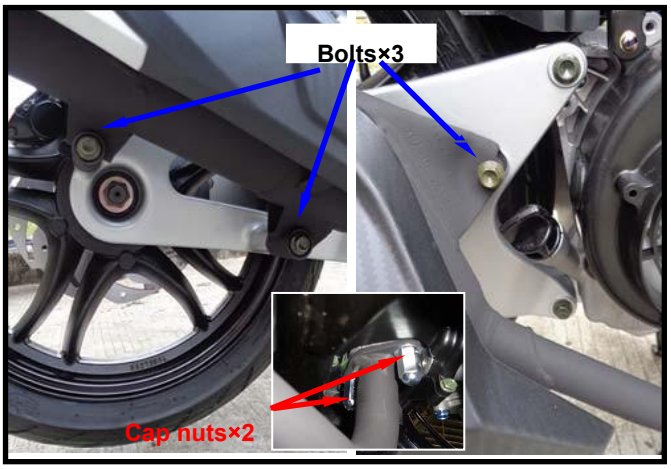
Remove the spark plug cap.



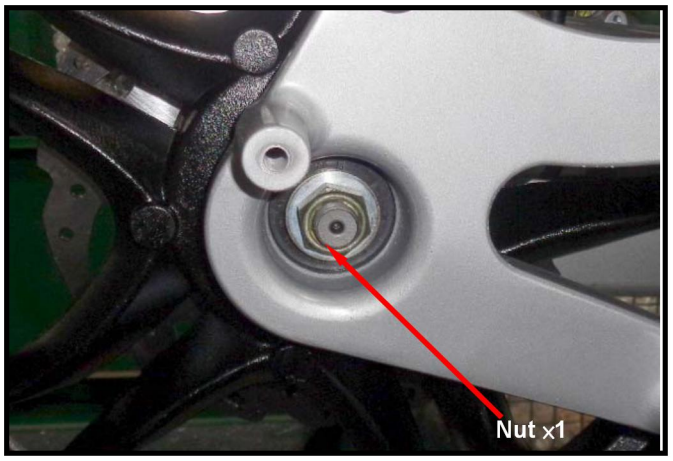
5. REMOVAL OF ENGINE

Remove the fuel pipe, vacuum hose, and throttle valve cable from the carburetor. Loose the strap screw of the air cleaner guide, and remove the air cleaner guide.

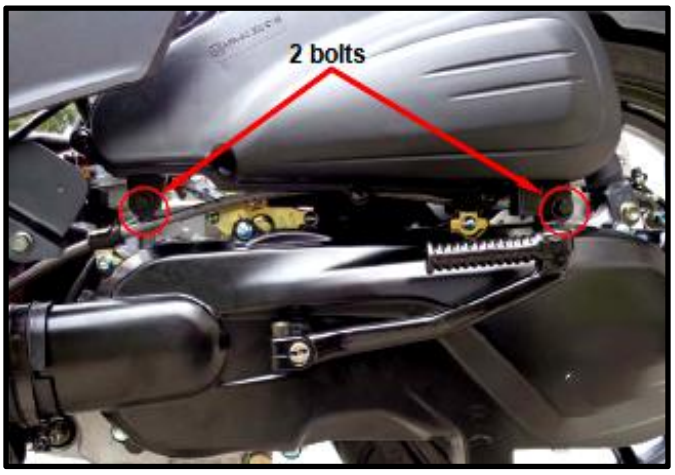
Remove the exhaust muffler (Bolts × 3, Cap Nuts × 2).



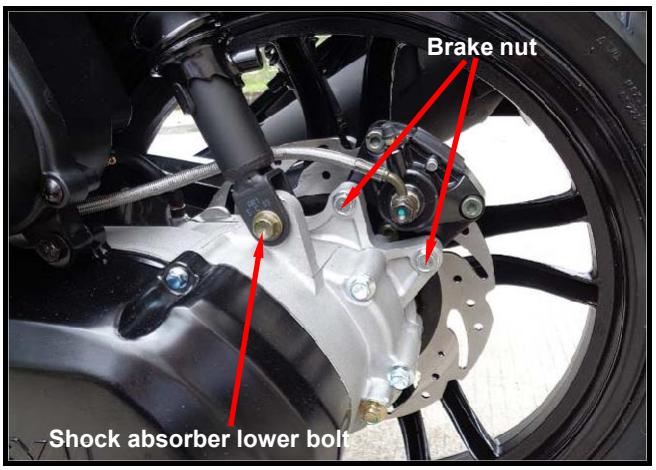
Remove the rear wheel (Nut × 1).



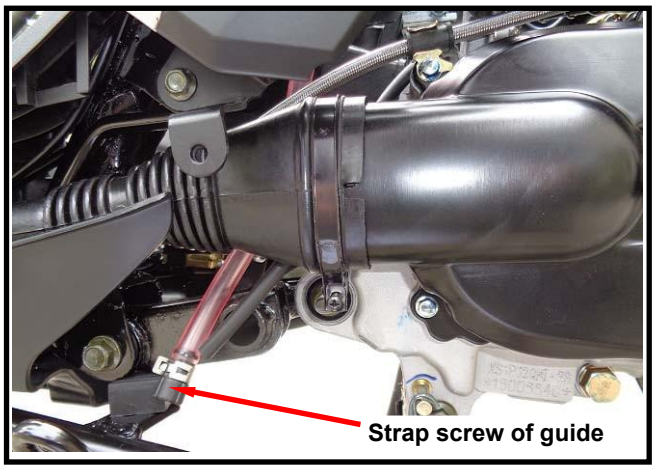
Remove the air cleaner connection bolts (2 bolts).



Remove the rear brake nut.
Remove the rear brake caliper
Remove the rear shock absorber lower bolt.



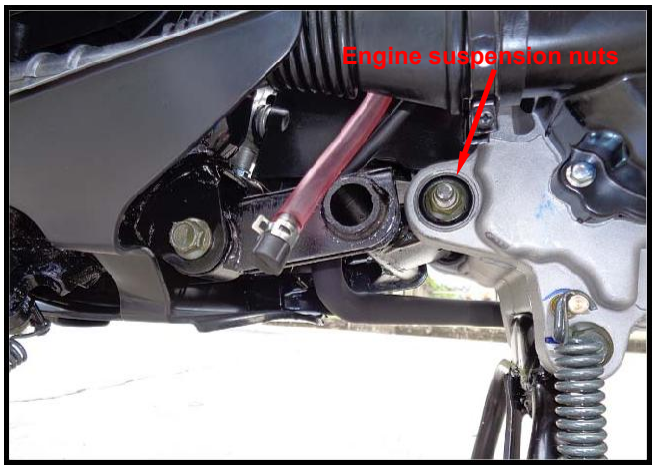
Loose the strap screw of engine left guide, and then remove the engine left guide.



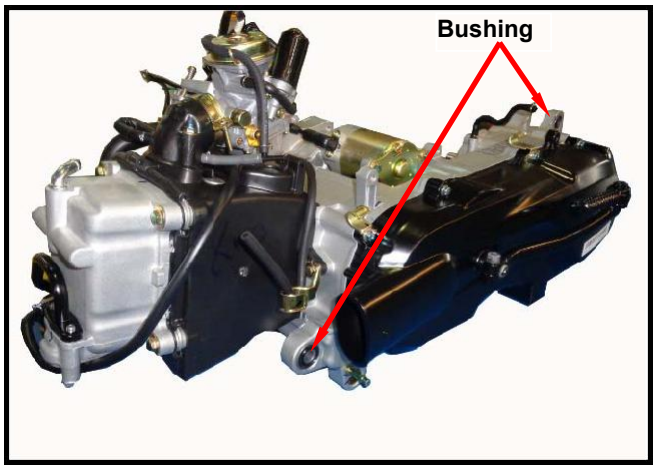
Remove the engine suspension nuts and bolts (engine side), and then remove the engine.

⚠ Caution

- With a bracket to support the engine to prevent from it damage by falling down as removing the engine.



Check if the engine suspension, rear shock absorber bushing, and cushion rubber for damage. Replace them with new ones if so.



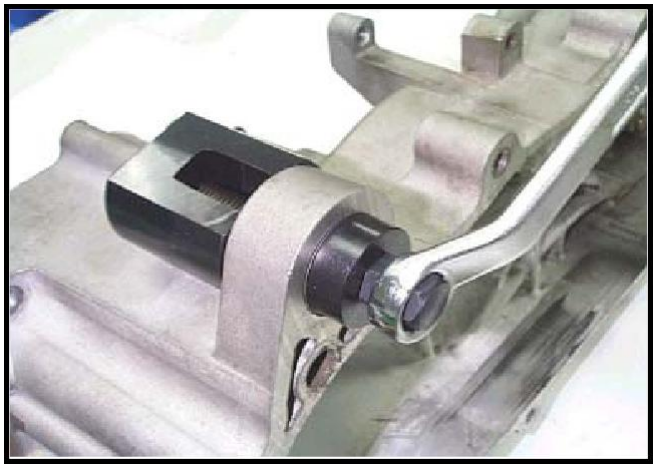
REMOVAL OF ENGINE

SUSPENSION BUSHING

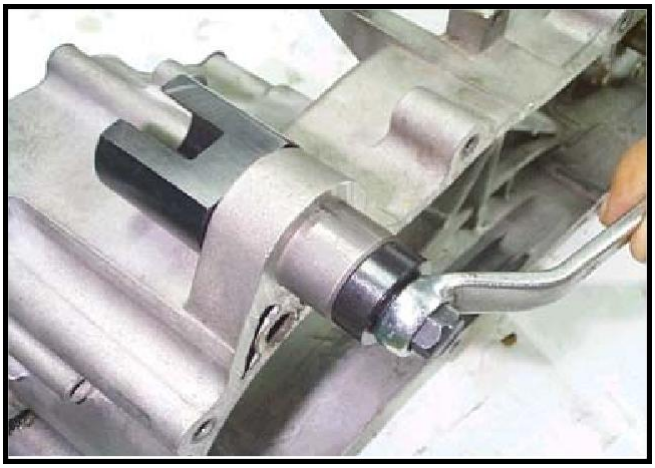
If engine suspension frame and the cushion rubber of rear shock absorber bushing damaged. Then, with the bushing remover / presser, Φ28mm &Φ20mm, to press the bushing out, and replace it with new one.

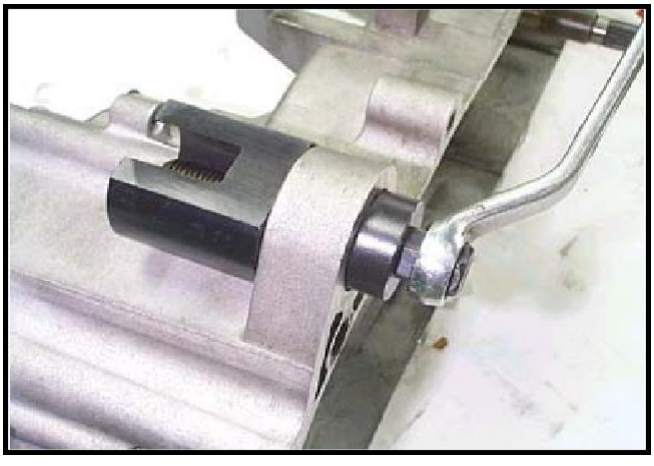
Engine suspension bushing: Φ**28mm**
Rear shock absorber bushing: Φ**20mm**

Pressing out
Place the detent section of the bushing remover toward the bushing, and drive both the pressing ring and bolt in to press the bushing out.



Pressing In
Place the flat section of the remover toward the bushing, and then drive the bushing, pressing ring, and bolt in to install the bushing.

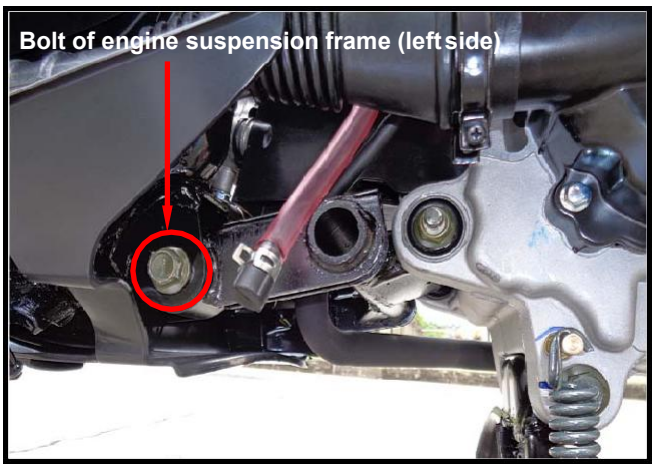




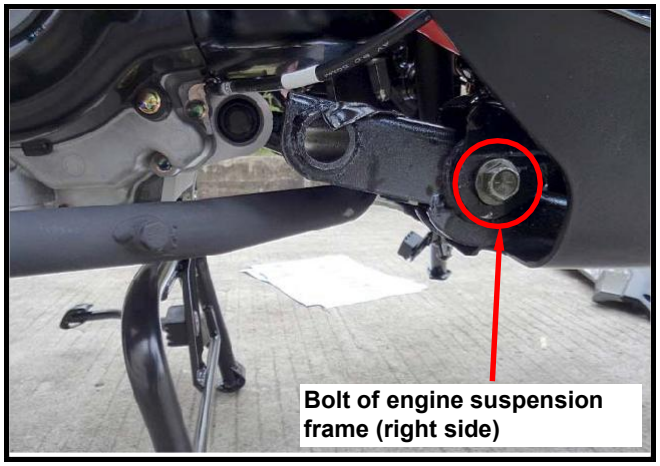
ENGINE SUSPENSION FRAME

Removal

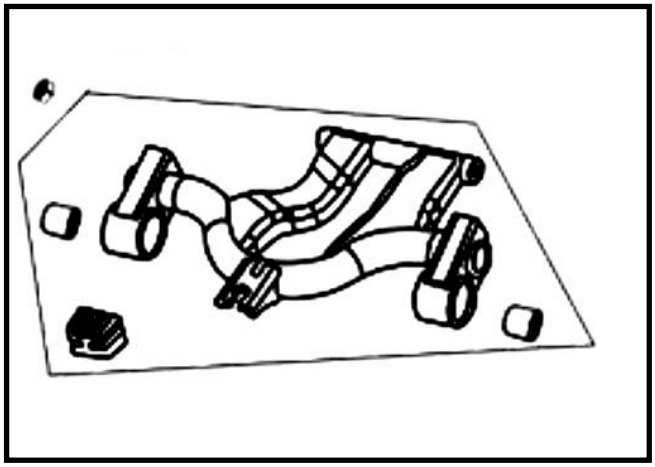
Remove the left side bolt of engine suspension frame.



Remove the right side bolt of engine suspension frame.



Check if the engine suspension frame bushing and cushion rubber for damage. If so, replace with new ones.



Installation

Tighten the bolts and nuts of engine suspension frame.

Engine suspension frame nut:
Torque Value: 4.5~5.5 kgf-m

INSTALLATION OF ENGINE

Check if the bushings of engine suspension frame and shock absorber for damaged. If so, replace with new ones.
Install the engine according to the reversing order of removal.

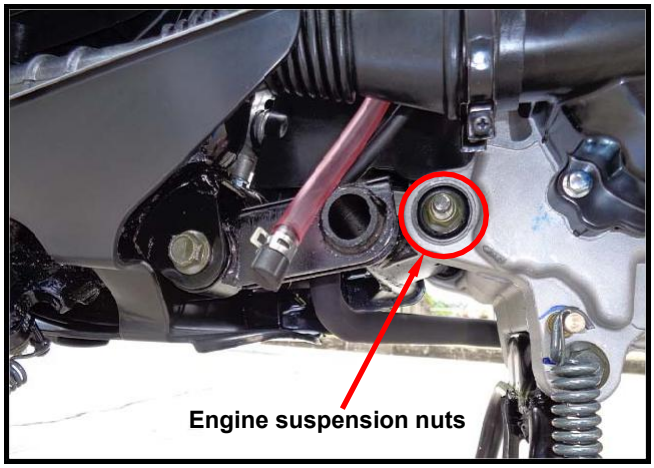
⚠ Caution

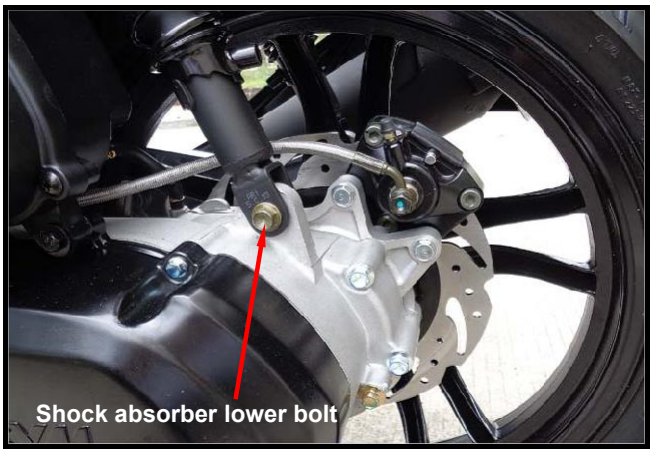
- Notice both feet and hands safety for squeezing as engine installation.
- Do not bent or squeeze each wires or hose.
- Route all cables and wires in accordance with the routine layout.

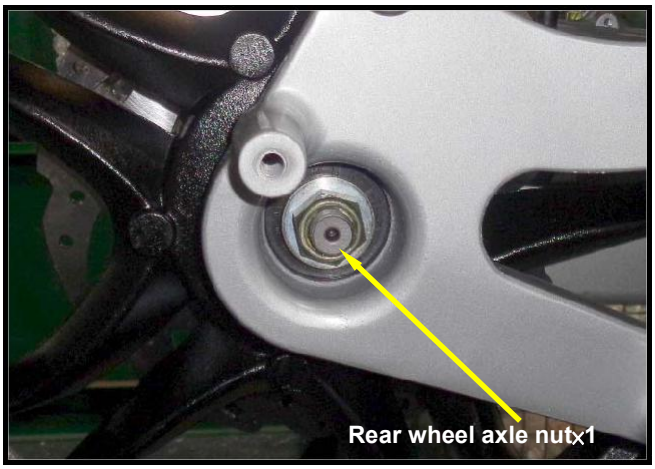
Engine suspension nut:
Torque Value: 4.5~5.5kgf-m

Rear shock absorber bolt:
Torque Value: Top: 3.5~4.5kgf-m
lower: 2.4~3.0kgf-m

Rear wheel axle nut:
Torque Value: 11.0~13.0kgf-m







6.CYLINDER HEAD/VALVE

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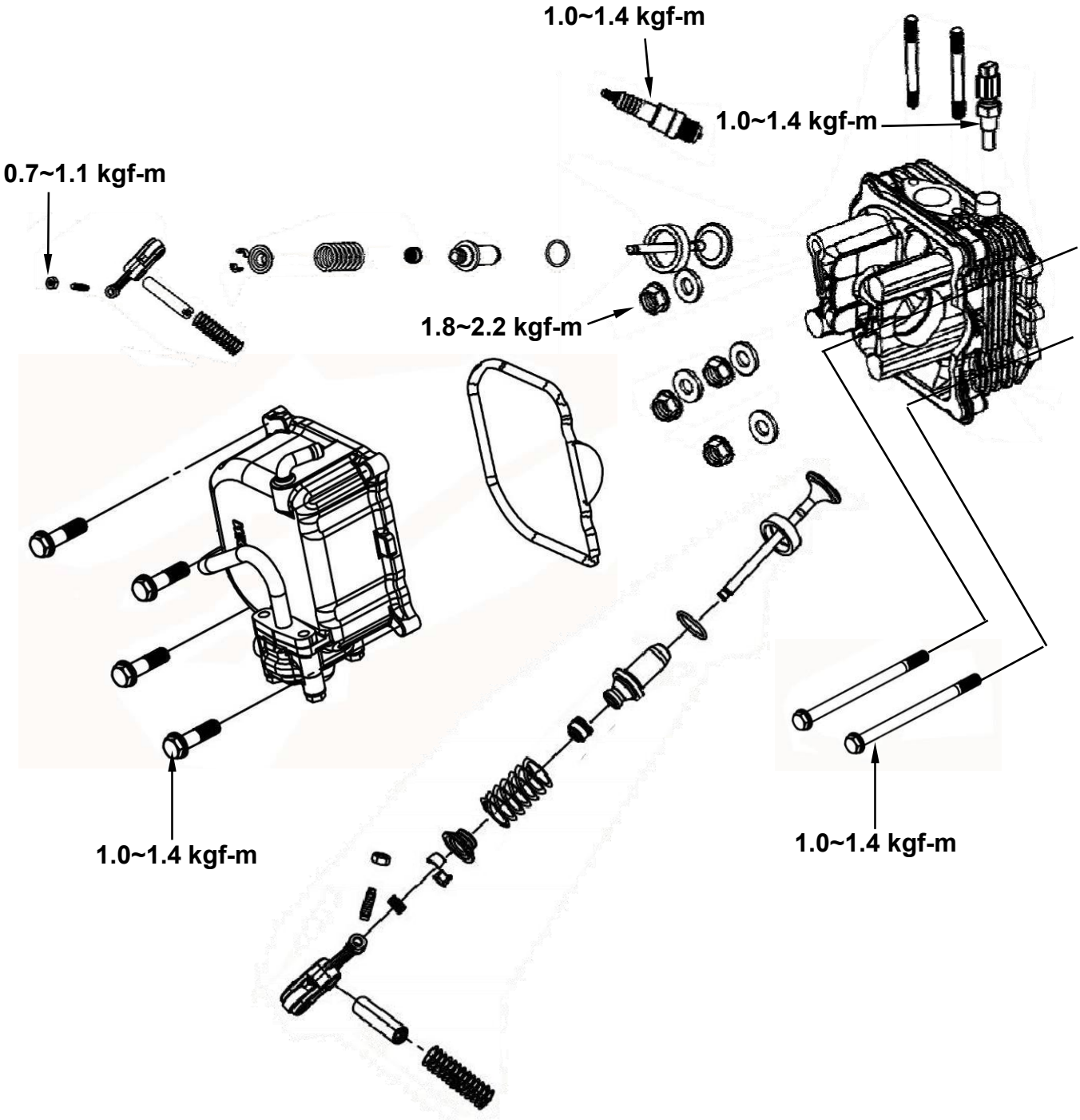
MECHANISM DIAGRAM



6. CYLINDER HEAD/VALVE

PRECAUTIONS IN OPERATION

General Information

- This chapter is contained maintenance and service for cylinder head, valve, and camshaft as well as valve rocker arm.
- Cylinder head service cannot be carried out when engine is in frame.

Specification **unit: mm**

Item			Standard	Limit
Compression pressure			10.68 ± 0.2 kg/cm²	-
Camshaft	Height of cam lobe	Intake	20.231	20.570
		Exhaust	19.907	19.410
Rocker arm	ID of valve rocker arm		10.00~10.015	10.10
	OD of valve rocker arm shaft		9.972~9.987	9.910
Valve	OD of valve stem	Intake	4.970~4.980	4.900
		Exhaust	4.955~4.970	4.900
	ID of Guide		5.00~5.012	5.030
	Clearance between valve stem and guide	Intake	0.020~0.042	0.080
		Exhaust	0.030~0.057	0.100
	Free length of valve spring	Outer	35.250	-
		Inner	32.410	-
	Valve seat width		1.000	1.600

Torque Value

Cylinder head cover bolt	0.8~1.2kgf-m
Cylinder head bolt (LH)	0.7~1.1kgf-m
Sealing bolt of timing chain auto-adjuster	0.8~1.2kgf-m
Bolt of timing chain auto-adjuster	1.0~1.4kgf-m
Timing gear cover bolts	0.7~1.1kgf-m (apply with oil on bolt thread & seat)
Spark plug	1.0~1.4kgf-m

TOOLS

Special service tools

Valve reamer: 5.0mm
Valve guide driver: 5.0mm
Valve spring compressor

TROUBLE SHOOTING

Engine performance will be effected by troubles on engine top end. The troubles usually can be determinate or by performing cylinder compression test and judging the abnormal noise generated.

Rough Idle
Low compression pressure.

Low compression pressure

1. Valve
- Improper valve adjustment.
- Burnt or bended valve.
- Improper valve timing.
- Valve spring damaged.
- Valve carbon.
- Poor sealing on valve seat.
- Improper spark plug installation.

2. Cylinder head
- Cylinder head gasket leaking or damage.
- Tilt or crack cylinder surface.

3. Piston
- Piston ring worn out.

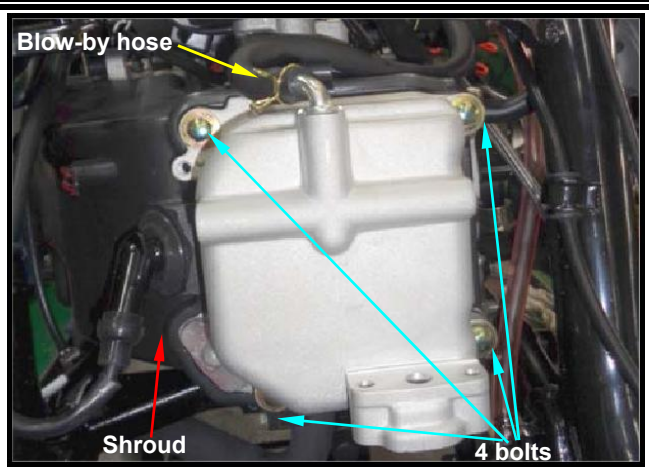
High compression pressure
- Too much carbon deposit on combustion chamber or piston head.

Noise
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Cam chain wear out or looseness
- Auto-adjuster wear out or damage of cam chain
- Camshaft sprocket wear out
- Rocker arm or rocker arm shaft wear out

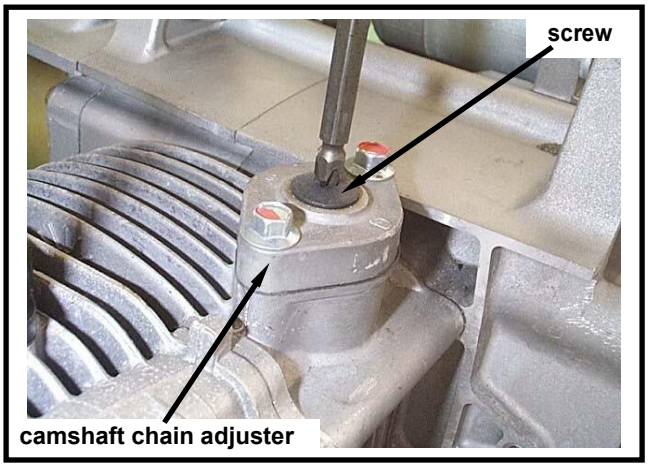
White smoke
- Valve guide or valve stem wear out
- Valve stem seal wear out

CAMSHAFT REMOVAL

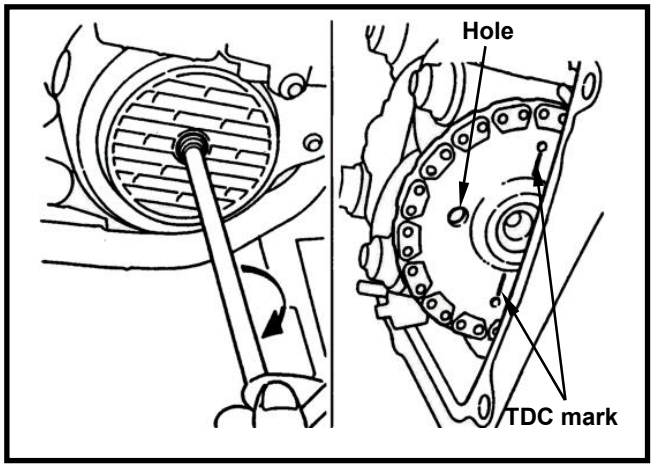
Remove the shroud of the engine.
Remove the crankcase blow-by system hose from the cylinder head.
Remove the cylinder head cover 4 bolts and then remove the cylinder head cover.



Loosen the screw of camshaft chain adjuster and remove O-ring.
With a flat screwdriver to tighten the screw of camshaft chain adjuster in a clockwise motion for release adjuster.



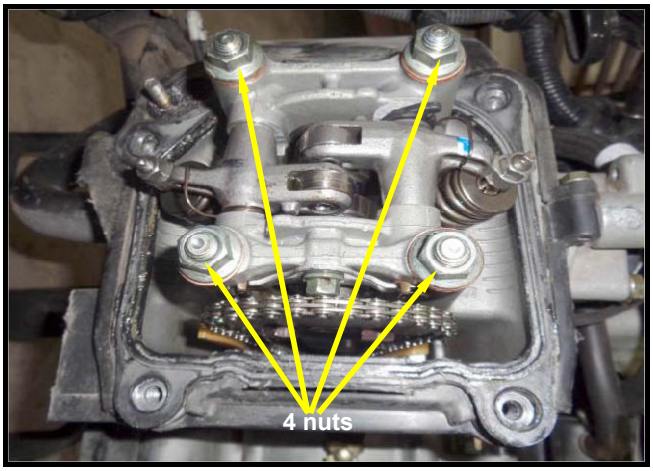
Turn the flywheel in counter-clockwise motion with T type wrench until the “T” mark on flywheel aligned with the mark on the crankcase so that the hole on the camshaft sprocket is forward up and piston is at TDC position.



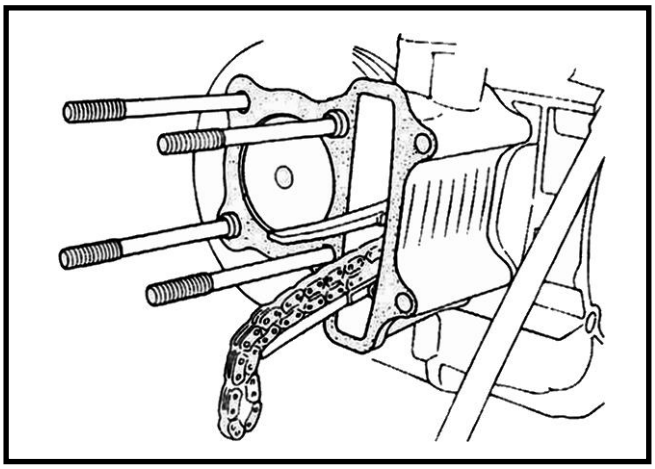
Remove camshaft holder nut and washer.

⚠ Caution

Loosen the nuts diagonally by 2-3 sequences.

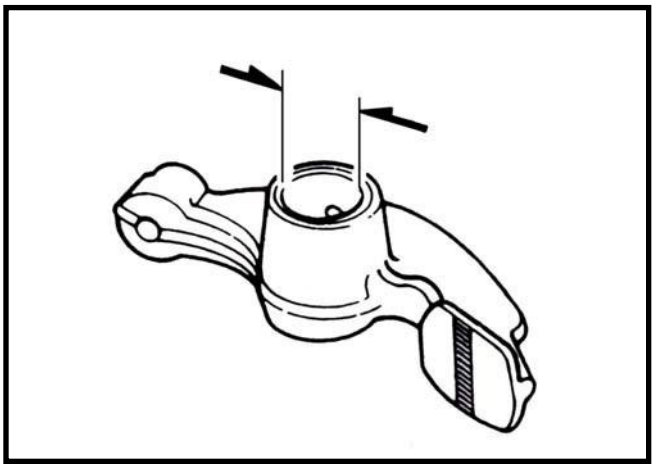


Remove the camshaft holder and rocker arm set.
Remove the camshaft chain from the camshaft sprocket.
Remove the cylinder head.



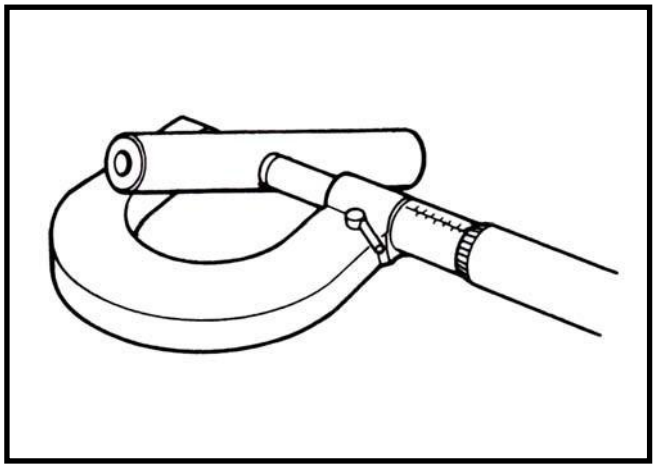
Camshaft Inspection
Inspect cam lobe height for damaged.
Service Limit
IN: Replacement when less than 20.570mm
EX: Replacement when less than 19.410 mm
Inspect the camshaft bearing for looseness or wear out. If any, replace whole set of camshaft and bearing.

Measure the valve rocker arm I.D.
Service Limit: Replace when it is above 10.100 mm



Measure the active O.D. of the valve rocker arm shaft .
Service Limit: Replace when it is above 9.910 mm

Calculate the clearance between the rocker arm shaft and the rocker arm.
Service Limit: Replace when it is above 0.10 mm

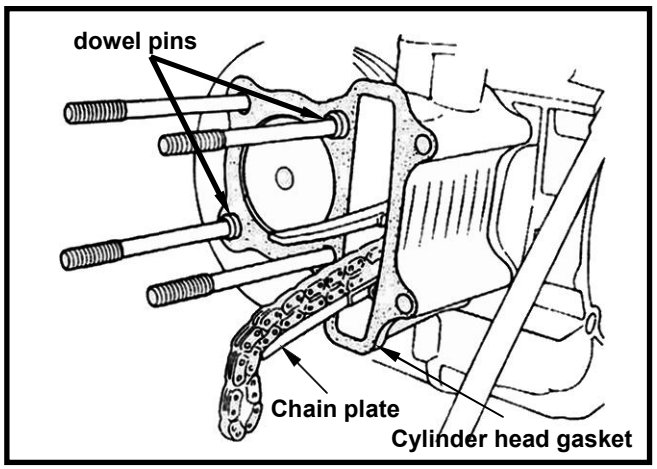


CYLINDER HEAD REMOVAL

Remove double seat, luggage box and front center cover.
Remove the engine (refer to Chapter 5).
Remove the cooling fan cover.
Remove the engine shroud .

Remove the camshaft sprocket.

Remove the 2 cylinder head mounting bolts from cylinder head left side cover.
Remove cylinder head gasket and 2 dowel pins.
Remove chain plate.
Clean up residues from the matching surfaces of cylinder and cylinder head.

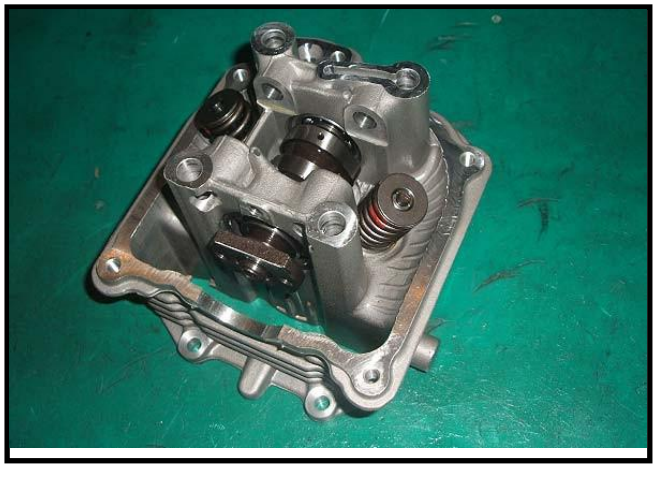


⚠ Caution

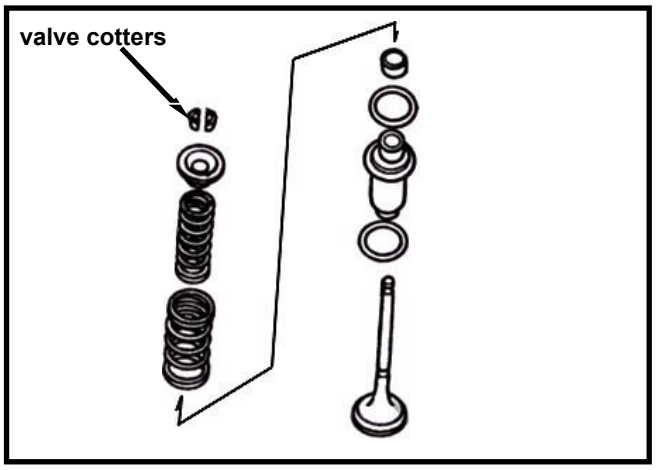
- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.

CYLINDER HEAD DISASSEMBLY

Use a valve compressor to press the valve spring.



After removed valve cotters, release the compressor and then take out spring retainer, valve spring and valves.



⚠ Caution

In order to avoid to loosing spring tension, do not compress the spring too much. Its length is based on the installation of latch.

Special Service Tool: Valve spring compressor.

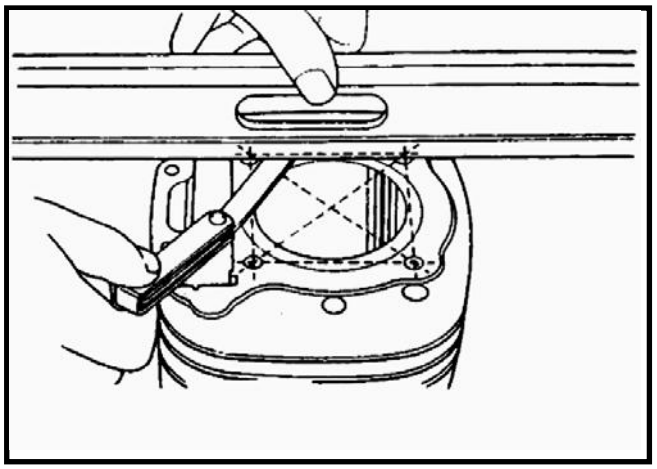
Remove valve stem guide seal.
Clean carbon deposits in combustion chamber.
Clean residues and foreign materials on cylinder head matching surface.

⚠ Caution

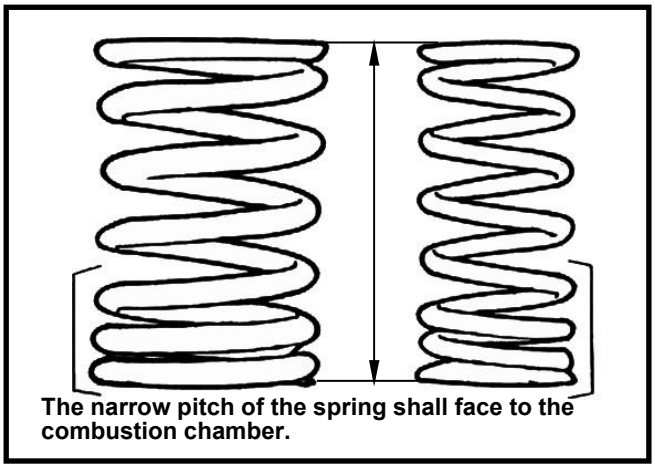
Do not damage the matching surface of cylinder head.

CYLINDER HEAD INSPECTION

Check if spark plug and valve holes are crack.
Measure cylinder head flat with a straightedge and flat feeler gauge.
Service limit: 0.05mm



Valve spring free length
Measure the free length of intake and exhaust valve springs.
Standard
Outer : 35.250 mm
Inner : 32.410 mm

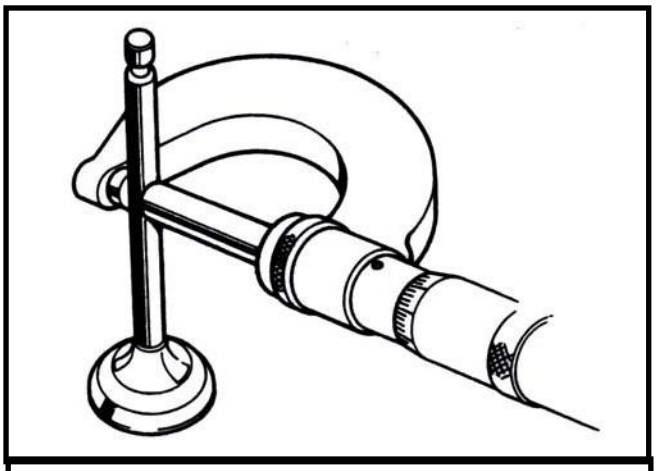


Valve stem

Check if valve stems are bend, crack or burn. Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.

Service Limit: IN→ 4.900mm

EX→ 4.900mm



Valve guide

⚠ Caution

Before measuring the valve guide, clean carbon deposits with reamer.

Special Service Tool: 5.0mm valve guide reamer

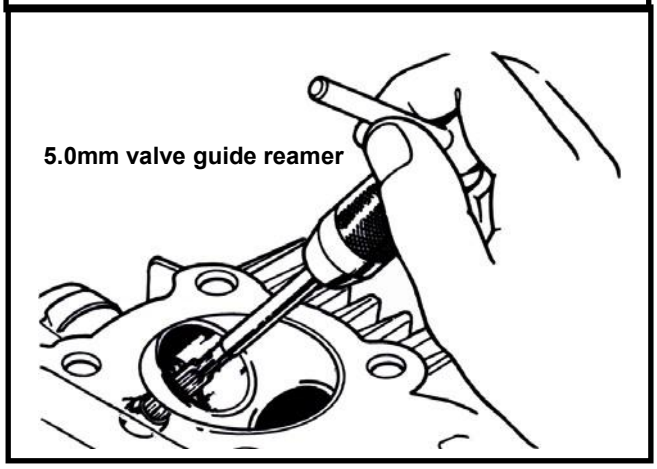
Measure and record each valve guide inner diameters.

Service limit: 5.030mm

The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance between the valve stem and valve guide.

Service Limit: IN→ 0.08mm

EX→ 0.10mm

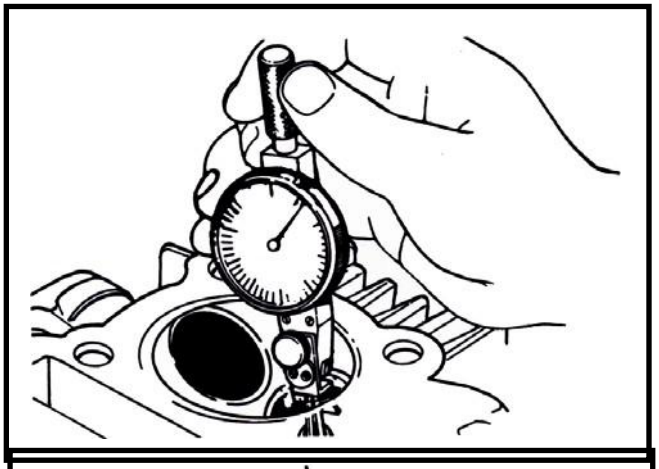


⚠ Caution

If clearance between valve stem and valve guide exceeded service limit, check whether the new clearance that only replaces new valve guide is within service limit or not. If so, replace valve guide.

Correct it with reamer after replacement.

If clearance still exceeds service limit after replaced valve guide, replace valve stem too.

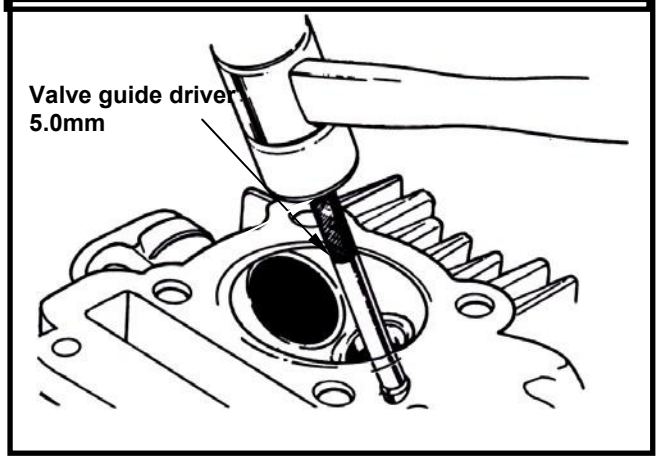


⚠ Caution

It must correct valve seat when replacing valve guide.

Valve guide replacement

Heat up cylinder head to 100~150 ℃ with heated plate or toaster.



⚠ Caution

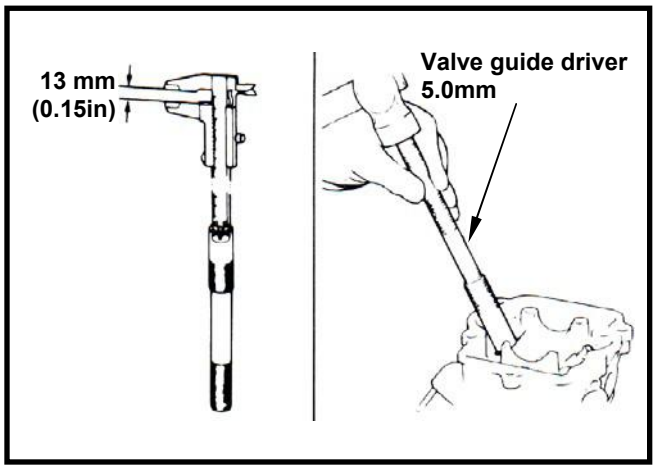
- Do not let torch heat cylinder head directly. Otherwise, the cylinder head may be deformed as heating it.
- Wear on a pair of glove to protect your hands when operating.

Hold the cylinder head, and then press out old valve guide from combustion chamber side.
Tool: Valve guide driver 5 mm

⚠ Caution

- Check if new valve guide is deformation after pressed it in.
- When pressing in the new valve guide, cylinder head still must be kept in 100~150 ℃.

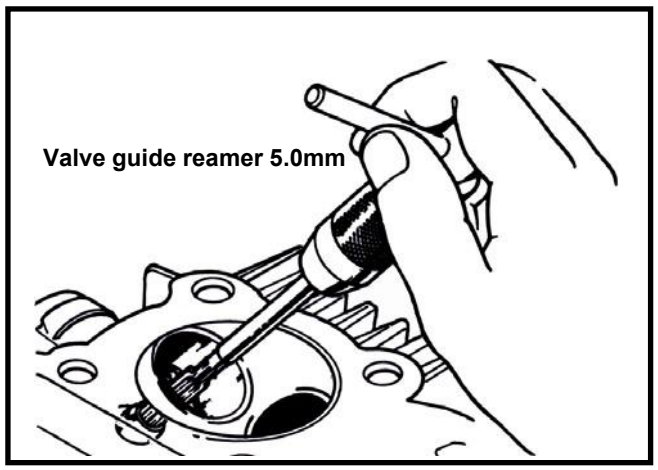
Adjust the valve guide driver and let valve guide height is in 13mm.



Press in new valve guide from rocker arm side.
0Tool: Valve guide driver 5 mm
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

⚠ Caution

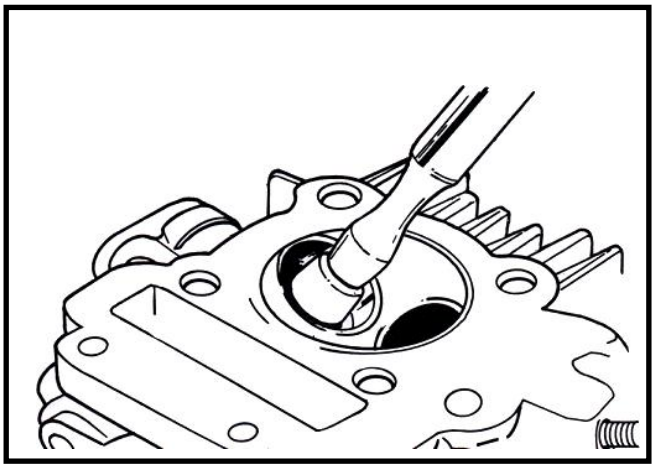
- Using cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when it be inserted or rotated.



Correct valve seat, and clean up all metal residues from cylinder head.
Special tool: Valve guide reamer 5 mm

VALVE SEAT INSPECTION AND SERVICE

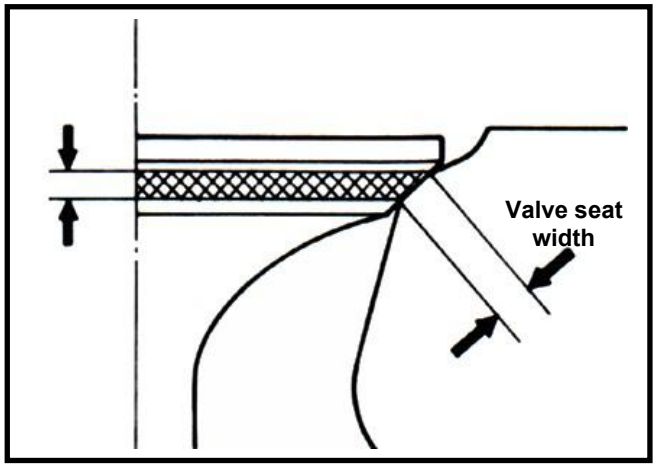
Clean up all carbon deposits onto intake and exhaust valves.
Apply with emery slightly onto valve contact face. Grind valve seat with a rubber hose or other manual grinding tool.



⚠ Caution

- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with red paint onto contact faces of valve and valve seat.

Remove the valve and check its contact face.



⚠ Caution

- Replace the valve with new one if valve seat is roughness, wear out, or incomplete contacted with valve seat.
- If the valve and the valve seat still can not be matched sealing after grinded, replace it with new one.

Valve seat inspection
If the valve seat is too width, narrow or rough, correct it.

Valve seat width
Service limit: 1.6mm
Check the contact condition of valve seat.

Valve seat grinding
The worn valve seat has to be grinded with valve seat chamfer cutter.
Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.

⚠ Caution

After valve guide had been replaced, it has to be grinded with 45° valve seal chamfer cutter to correct its seat face.

Use 32° cutter to cut a quarter upper part out.

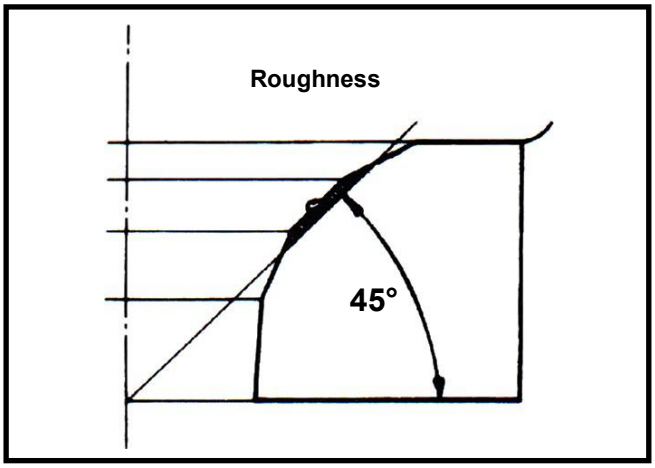
Use 60° cutter to cut a quarter lower part out.
Remove the cutter and check new valve seat.

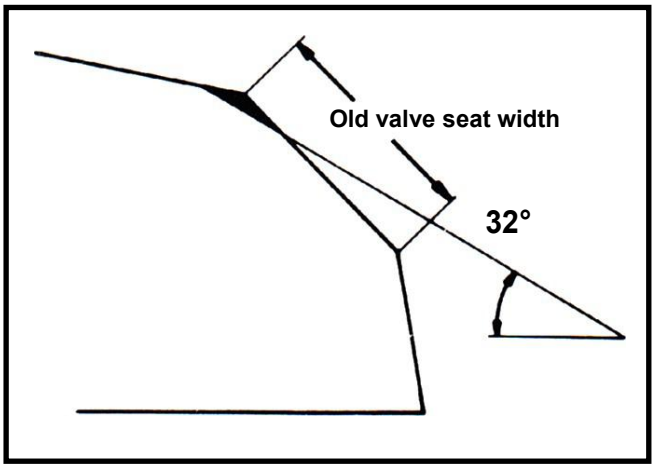
Use 45° cutter to grind the valve seat to specified width.

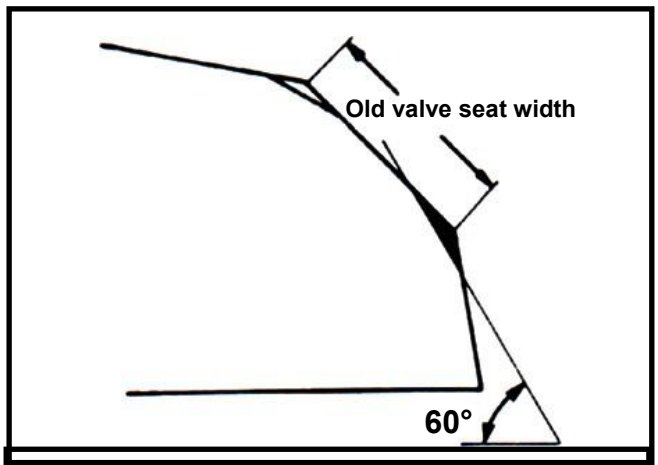
⚠ Caution

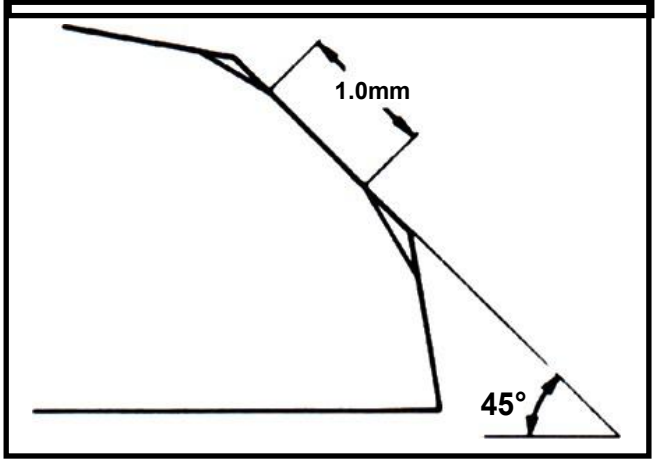
Make sure that all roughness and uneven faces had been grinded.

Grind valve seat again if necessary.





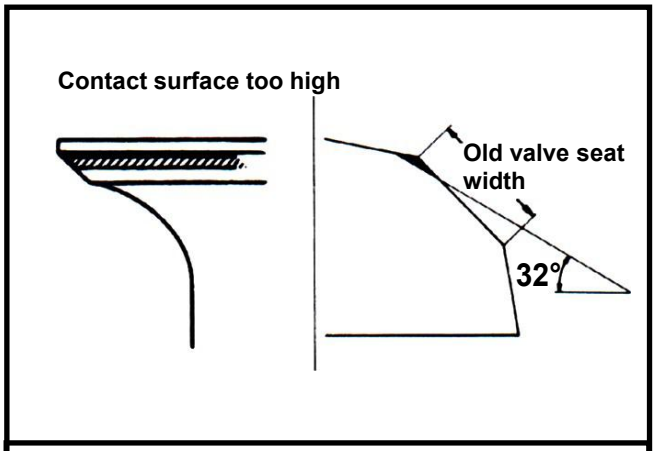




Coat the valve seat surface with red paint.
Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

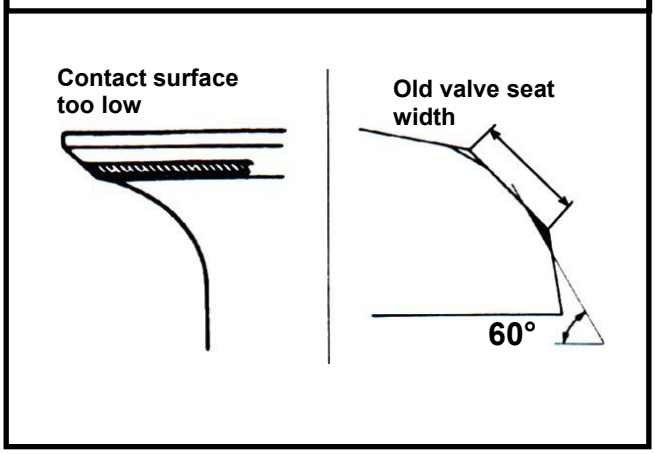
⚠ Caution

The contact surfaces of valve and valve seat are very important to the valve sealing capacity.

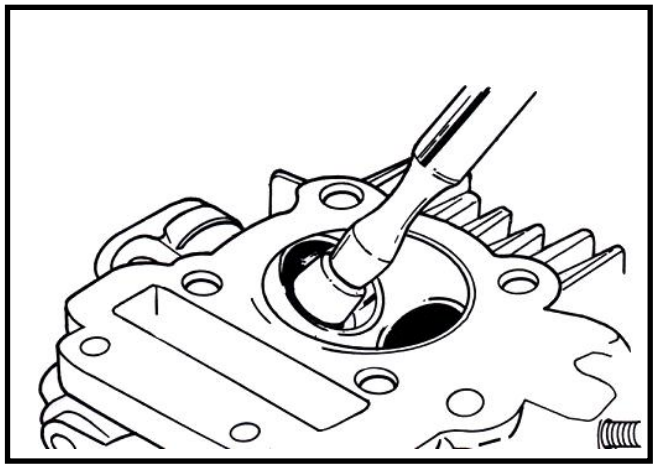


If the contact surface too high, grind the valve seat with 32° cutter.
Then, grind the valve seat with 45° cutter to specified width.

If the contact surface too low, grind the valve seat with 60° cutter.
Then, grind the valve seat with 45° cutter to specified width.



After the valve seat grinded, coat valve seat surface with emery and then slightly press the grinded surface.
Clean up all emery coated onto cylinder and valve after grinded.

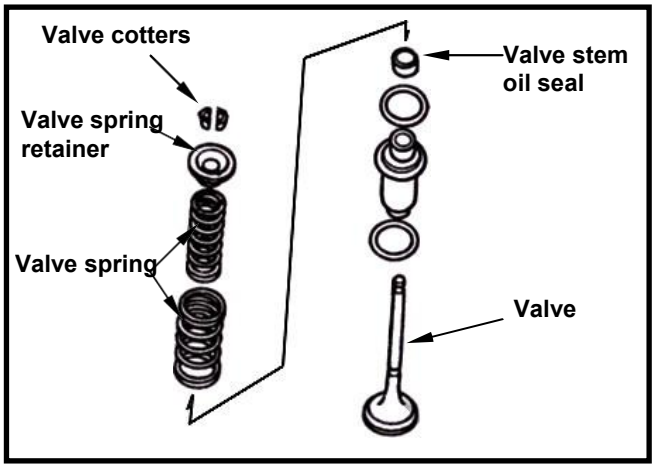


CYLINDER HEAD REASSEMBLY

Lubricate valve stem with engine oil, and then insert the valve into valve guide.
Install new valve stem oil seal. Install valve springs and retainers.

⚠ Caution

The closed coils of valve spring should face down to combustion chamber.

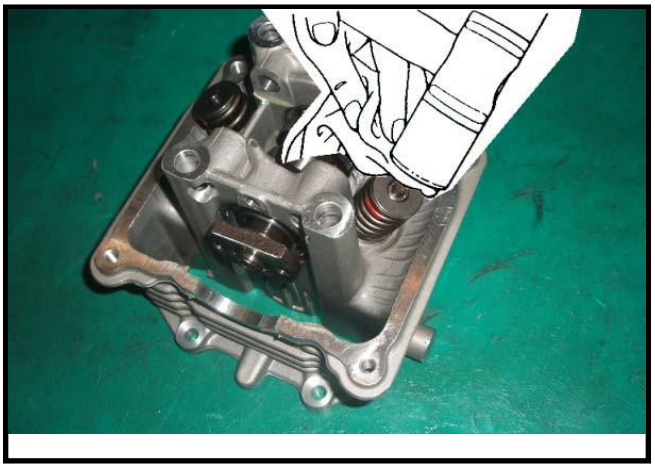


Use valve spring compressor to press valve spring.
Install valve split locks and release the valve compressor.

⚠ Caution

In order to avoid to loosing spring tension, do not compress the spring too much. Its length is based on the installation of latch.

Special tool: valve spring compressor



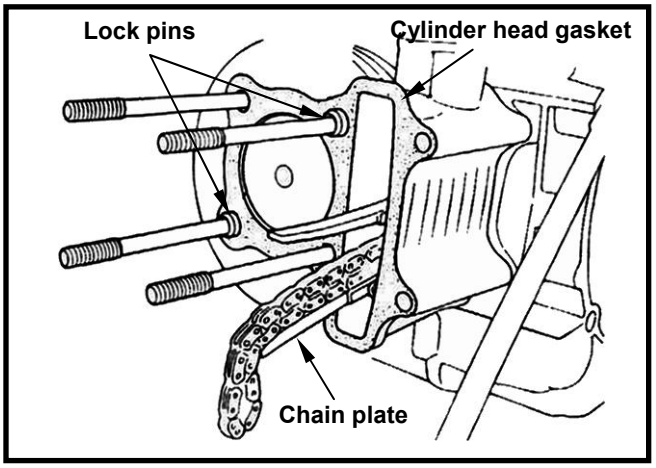
Tap valve stem to make valve retainer and valve stem sealing properly.

⚠ Caution

Place and hold cylinder head on to working table so that can prevent from valve damaged.

CYLINDER HEAD INSTALLATION

Install the lock pins and new cylinder head gasket onto the cylinder head.
Install the camshaft chain plate.



With T type wrench to turn crankshaft in a clockwise motion so that the “T” mark on the flywheel aligns with the mark on crankcase. (piston is at TDC position)
Place the TDC marks of the cam sprocket at same level of the top-end of cylinder head. The other single hole of the cam sprocket is in upward. Then, install the cam chain onto the cam sprocket.

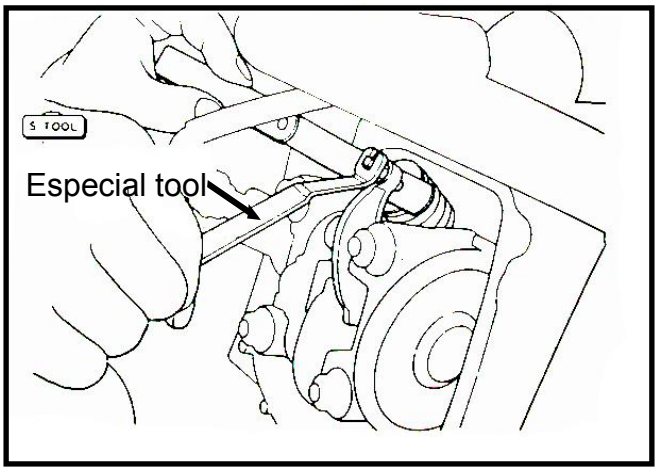
Install the cylinder head.

VALVE CLEARANCE ADJUSTMENT

Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.
Measure and adjust valve clearance with feeler gauge.
After valve clearance had been adjusted to standard value, hold adjustment bolt and then tighten the adjustment nut.

Standard Value: 0.12 ± 0.02mm

With flat screwdriver, turn the cam sprocket adjuster in counter-clockwise motion so that the adjuster is pushed out to contact the cam chain plate tightly.Apply with oil onto a new O-ring and then install it onto the adjuster hole.
Tighten the bolt cap of the adjuster adjustment hole.



⚠ Caution

The O-ring must be installed into glove.

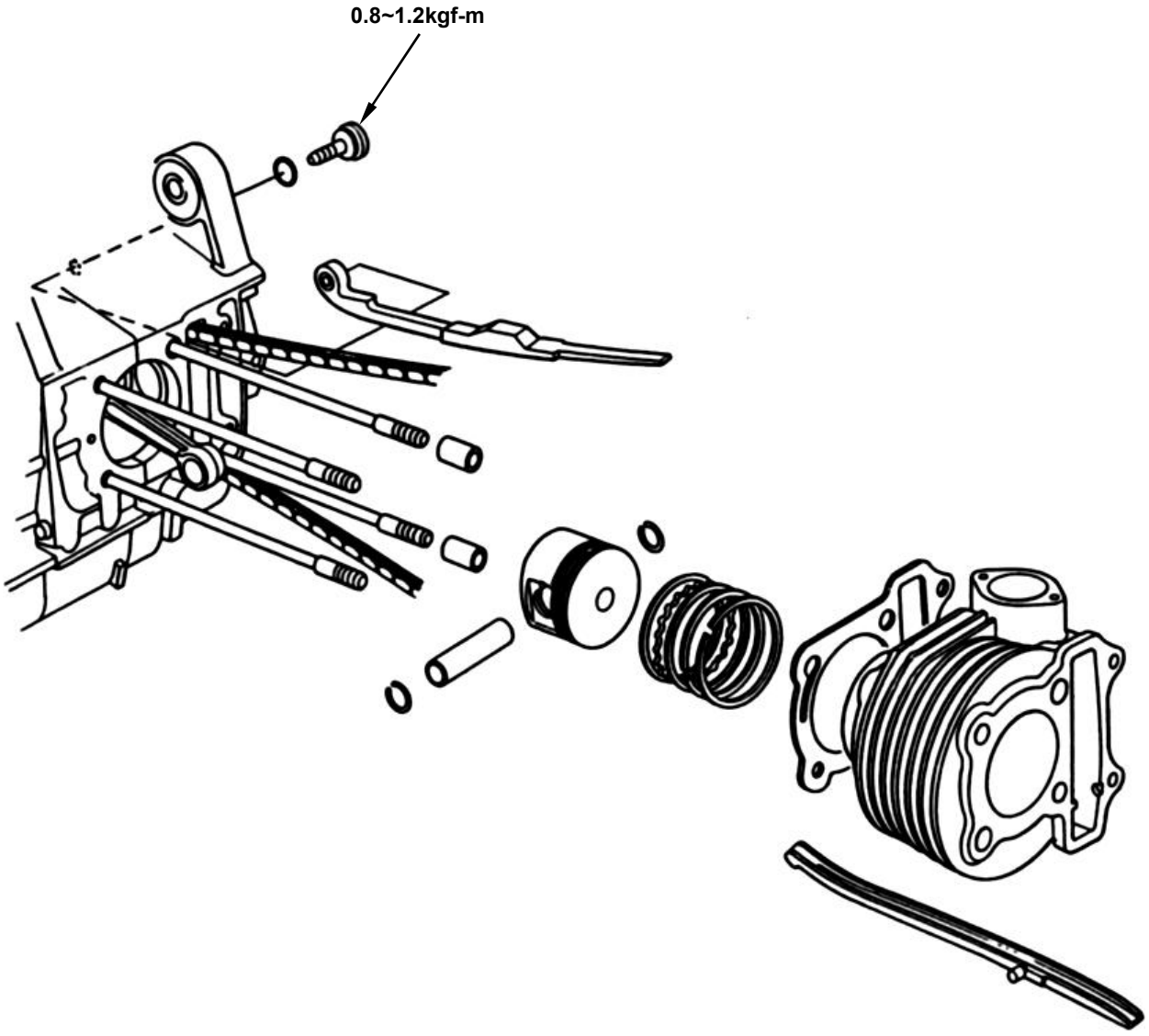
Replace the O-ring of the cylinder head with new one. Install the cylinder head.

Tighten the cylinder head lock bolts. Connect the blow-by hose onto the cylinder head.
Install the engine onto the engine frame.
(Refer to Chapter 5)

7.CYLINDER/PISTON

CONTENTS

MECHANISM DIAGRAM



7. CYLINDER/PISTON

PRECAUTIONS IN OPERATION

General Information

- Both cylinder and piston service cannot be carried out when engine mounted on frame.

Specification **unit: mm**

Item			Standard	Limit
Cylinder	ID		52.395~52.415	52.50
	Bend/wrap age		Less than 0.05	0.050
	Roundness		Less than 0.01	0.050
	Cylindrical		Less than 0.05	0.050
Piston/ Piston ring	Clearance between piston and rings	Top ring	0.05~0.105	0.145
		2nd ring	0.05~0.105	0.145
	Ring-end gap	Top ring	0.100~0.2500	0.500
		2nd ring	0.300~0.500	0.750
		Oil ring	0.200~0.700	—
	OD of piston		52.385~52.405	52.310
	Piston OD measurement position		Lower-end up 7mm of piston skirt	—
	Clearance between piston and cylinder		0.005~0.015	0.100
	ID of piston pin hole		15.002~15.008	15.040
OD of piston pin			14.994~15.00	14.96
Clearance between piston and piston pin			0.002~0.014	0.020
ID of connecting rod small-end			15	15.06

TROUBLE DIAGNOSIS

Low Or Unstable Compression Pressure

- Cylinder or piston ring worn out.
- Compress pressure to high.
- Too much carbon deposited in combustion chamber and piston.

Knock or Noise

- Cylinder or piston ring worn out.
- Carbon deposits on cylinder head top-side.
- Piston pin hole and piston pin wear out.

Smoking in Exhaust Pipe

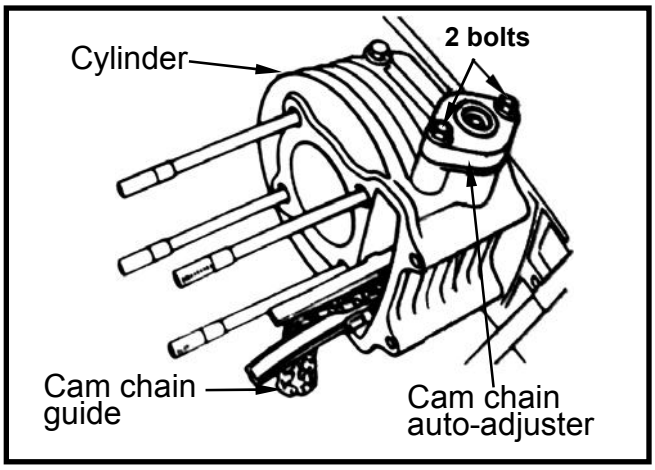
- Piston or piston ring worn out.
- Piston ring installation improperly.
- Cylinder or piston damage.5

Engine Overheat

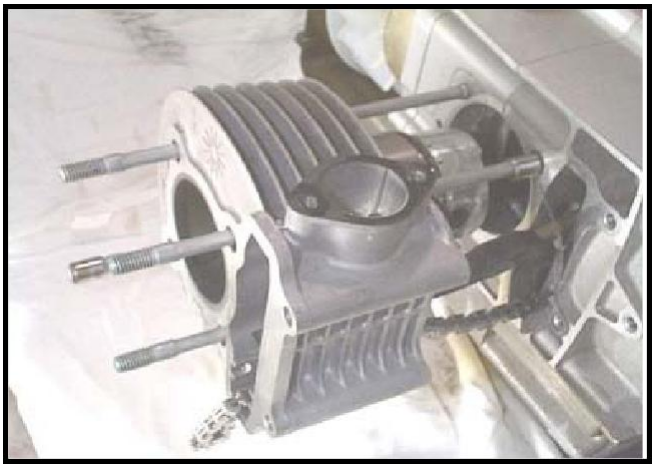
- Carbon deposits on cylinder head top side.

CYLINDER REMOVAL

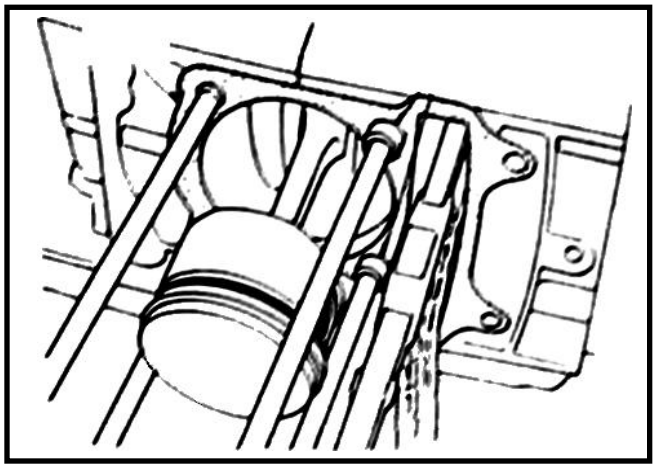
Remove cylinder head. (refer to chapter 6)
Remove 2 bolts and then take out the cam chain auto-adjuster.



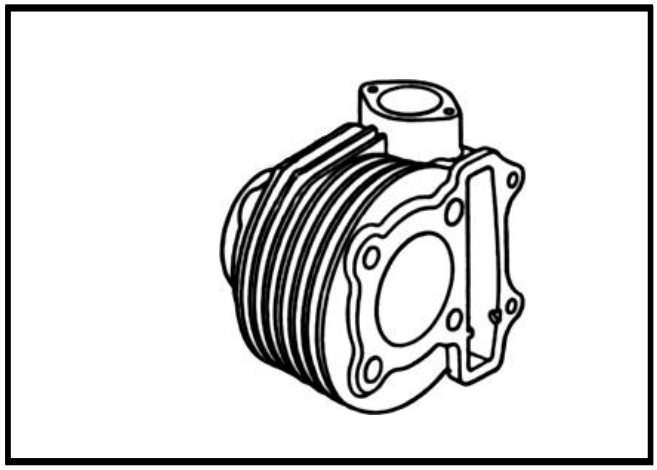
Remove cam chain plate.
Remove cylinder.



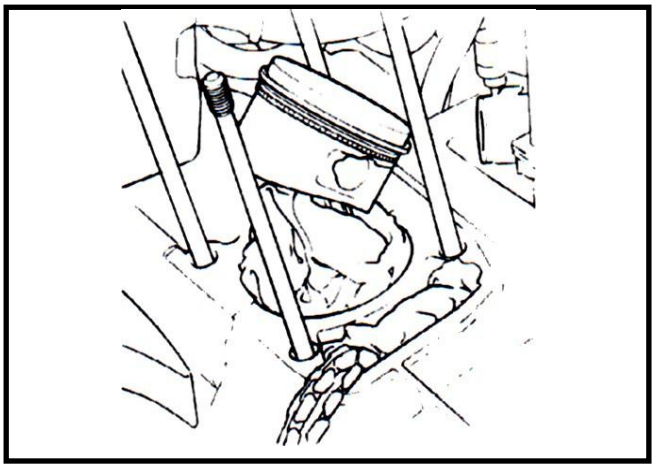
Remove cylinder gasket and lock pins



Clean the residues attached onto the matching surfaces of cylinder and crankcase.



Cover the holes of crankcase and cam chain with a piece of cleaning cloth.
Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase.

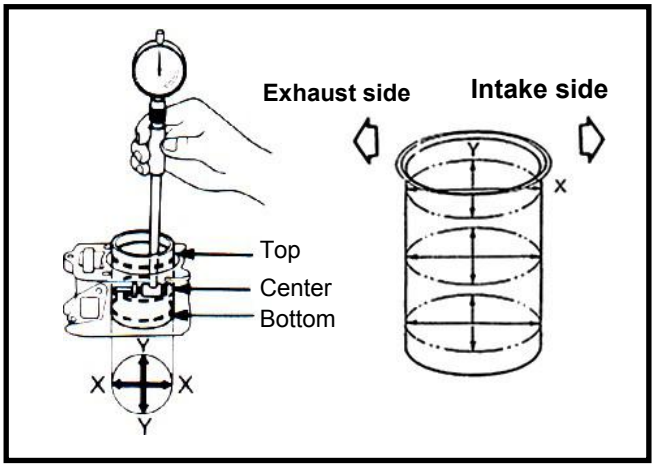


⚠ Caution

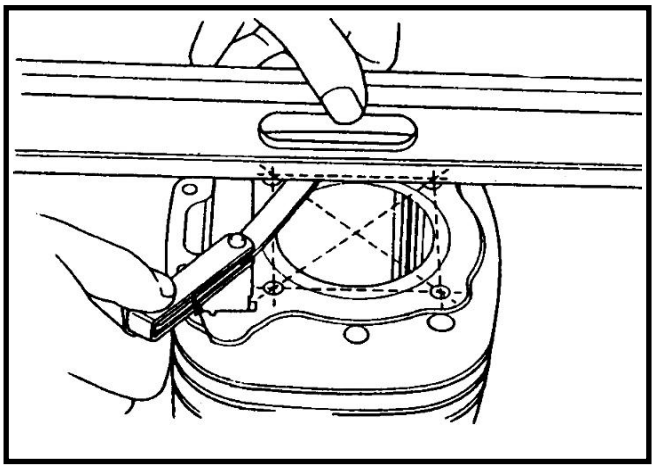
To soap the residues into solvent so that the residues can be removed more easily.

INSPECTION

Check if the inner diameter of cylinder is worn out or damaged.
In the 3 positions (top, center and bottom) of cylinder, measure the X and Y direction values respective in the cylinder.
Service limit: 57.7mm
Calculate both the real roundness (the difference between X and Y motion values) and the cylindrical roundness (the difference in the top, center or bottom positions of X or Y motion values.). Then, determinate by the max. value.
Service limit
Real roundness: correct or replace as over 0.05 mm
Cylindrical roundness: correct or replace as over 0.05 mm

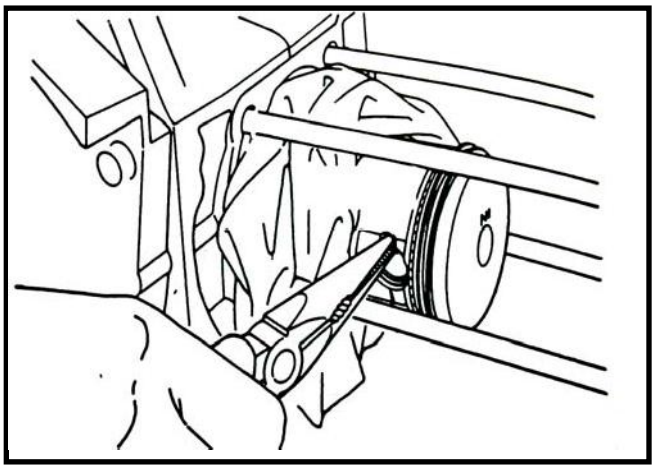


Check Cylinder flat.
Service limit: correct or replace as over 0.05 mm



PISTON REMOVAL

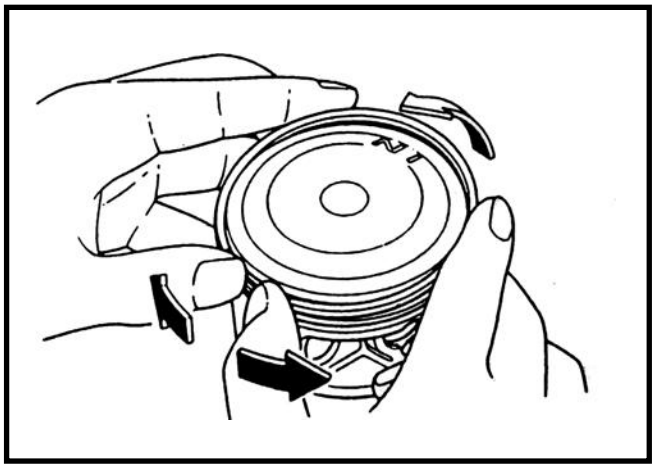
Plug crankcase opening with a cleaning cloth to prevent from piston pin snap ring or other parts falling into crankcase when disassembling.
Hold another snap ring with pliers.
Push out the piston pin from the side that not removed the snap ring.



Remove piston rings.

⚠ Caution

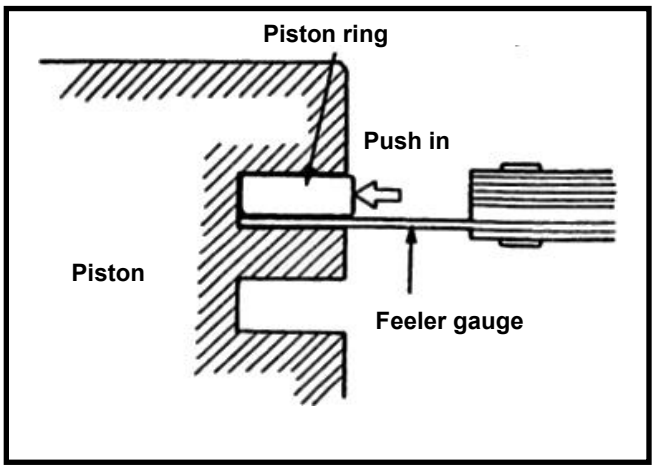
Pay attention to remove piston rings because they are fragile.



Disassemble the piston rings.
Check if the piston rings are damaged or its grooves are worn.
Cleaning the carbon in piston ring grooves.

Install the piston rings and then measure clearance between piston ring and its grooves.

Service Limit: Top ring: replace if over 0.145mm
2nd ring: replace if over 0.145mm

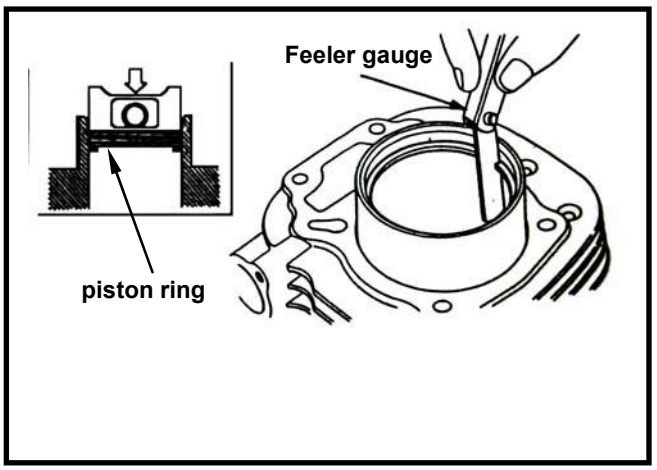


Take out the piston rings and place them respective into cylinder below 20mm of cylinder top. Measure each piston ring gaps.

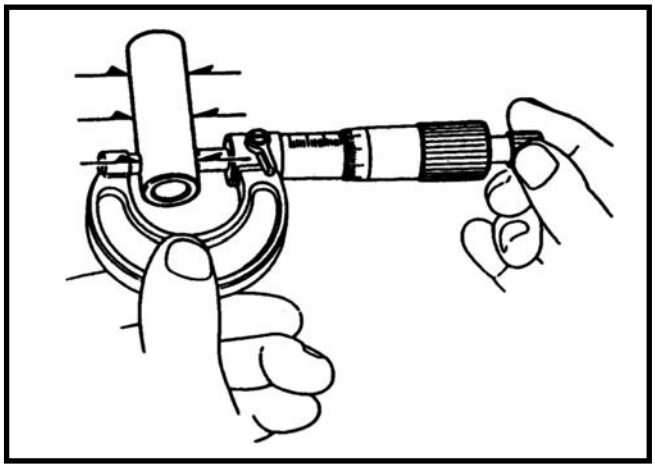
⚠ Caution

Push the piston rings into cylinder with piston top-end in parallel motion.

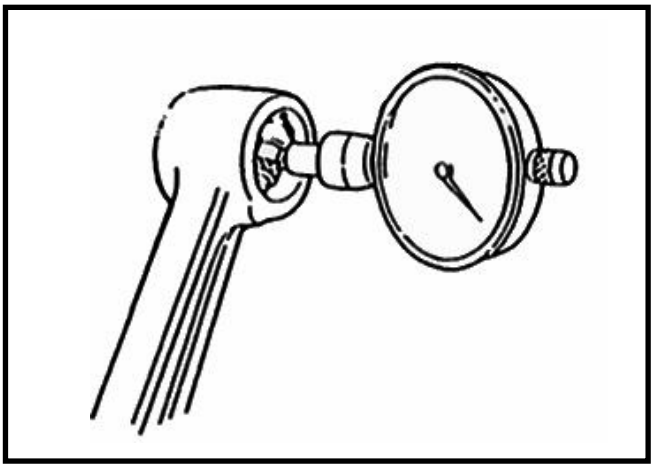
Service Limit: Top ring: replace if over 0.50mm
2nd ring: replace if over 0.750mm



Measure the outer diameter of piston pin.
Service Limit: 14.96mm

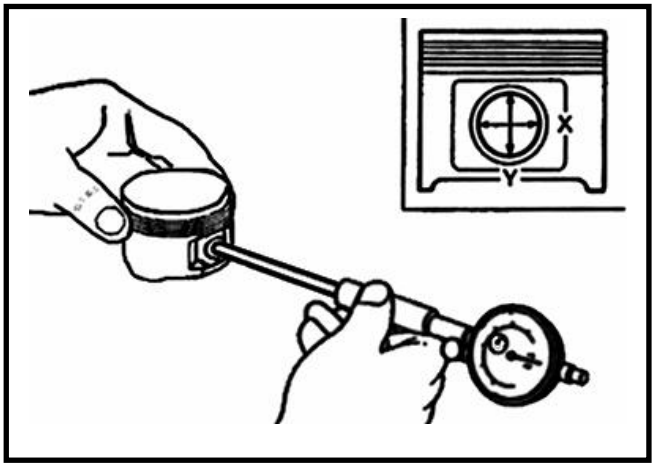


Measure the inner diameter of connecting rod small end.
Service Limit: 15.06mm



Measure the inner diameter of piston pin hole.
Service Limit: 15.04mm

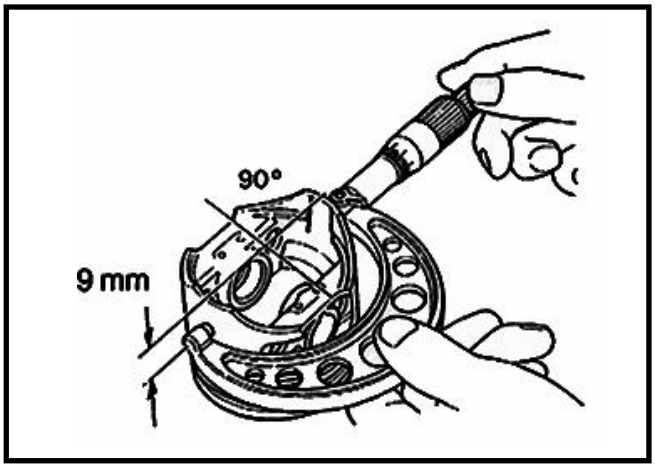
Calculate clearance between piston pin and its hole.
Service Limit: 0.02mm



Measure piston outer diameter.

⚠ **Caution**

The measurement position is 10 mm distance from piston bottom side, and 90° to piston pin.



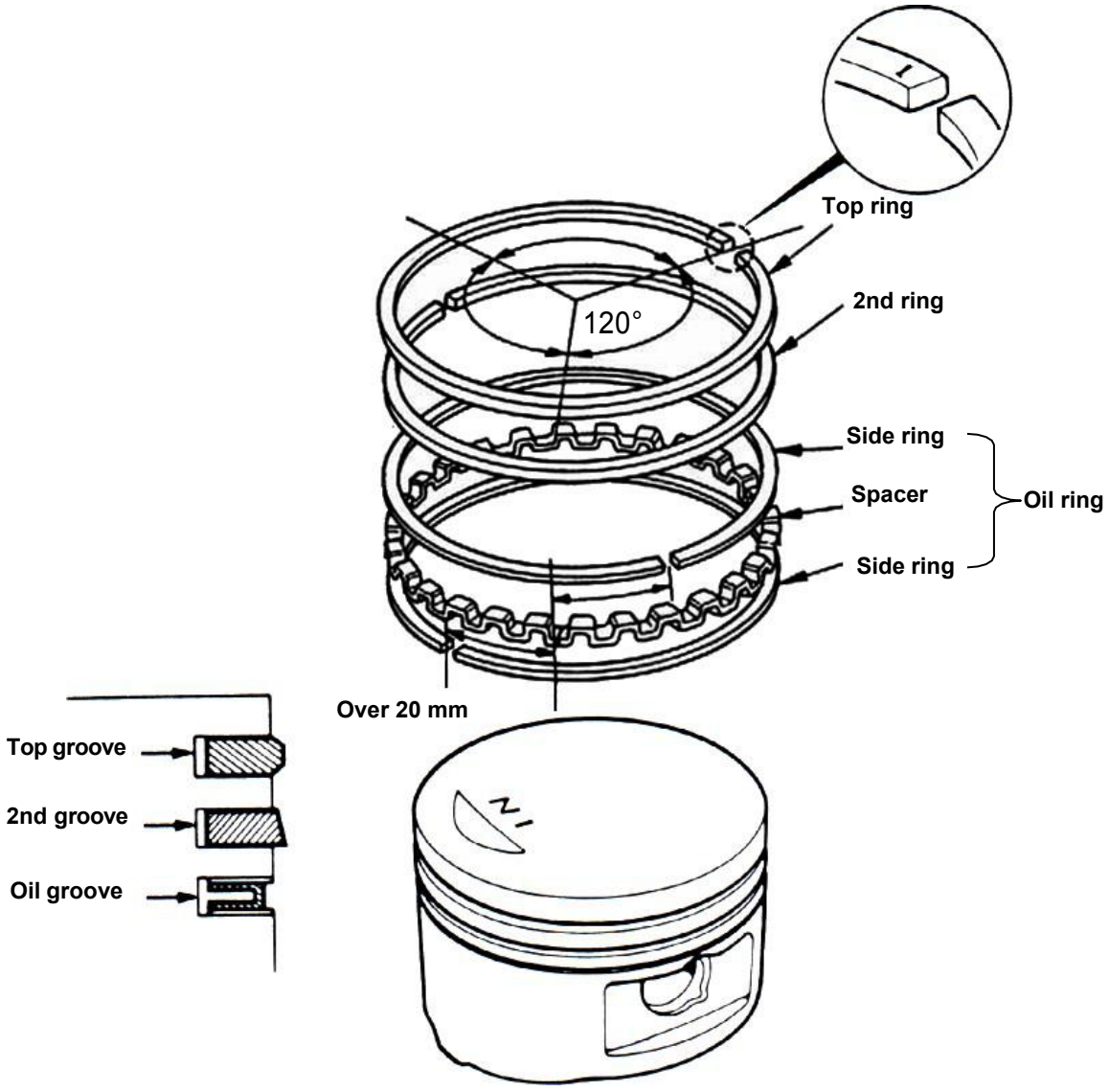
Service limit: 52.310mm
Compare measured value with service limit to calculate the clearance between piston and cylinder.

PISTON RING INSTALLATION

Clean up piston top, ring groove, and piston skirt.
Install the piston ring onto piston carefully.
Place the openings of piston ring as diagram shown.

⚠ Caution

- Do not damage piston and piston rings as installation.
- All marks on the piston rings must be forwarded to up side.
- Make sure that all piston rings can be rotated freely after installed.

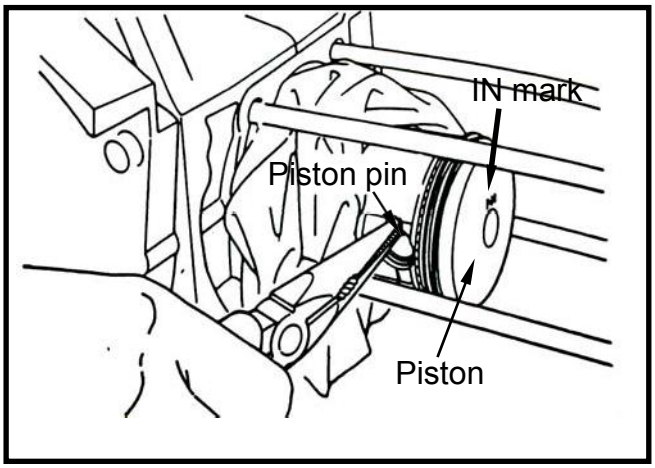


PISTON INSTALLATION

Install piston and piston pin, and place the IN mark on the piston top side forward to intake valve.
Install new piston pin snap ring.

⚠ Caution

- Do not let the opening of piston pin snap ring align with the opening piston ring.
- Place a piece of cleaning cloth between piston skirt section and crankcase in order to prevent snap ring from falling into crankcase as operation.

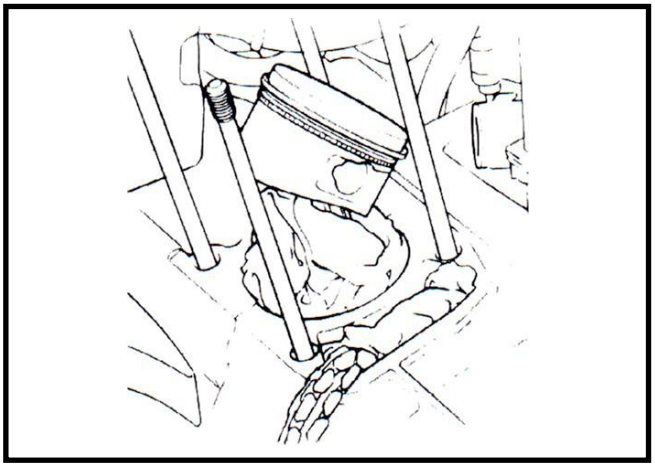


CYLINDER INSTALLATION

Clean up all residues and foreign materials on the matching surface of crankcase.
Pay attention to not let these residues and foreign materials fall into crankcase.

⚠ Caution

To soap the residues into solvent so that the residues can be removed more easily.

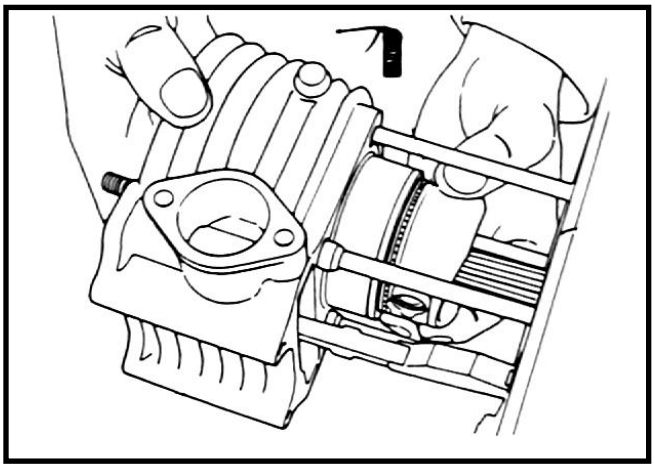


Install 2 lock pins and new gasket.

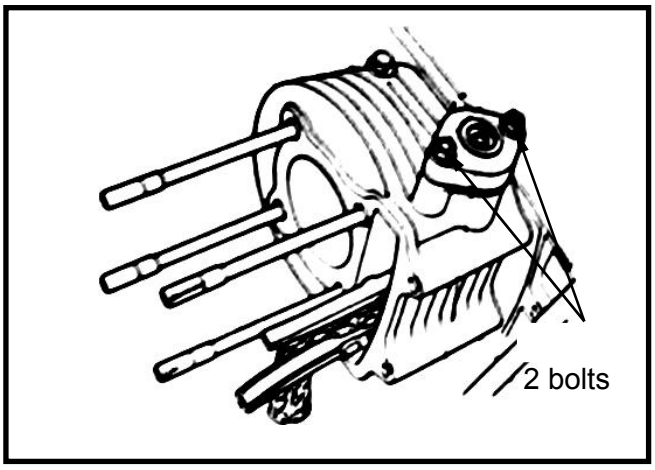
Coat engine oil to inside of cylinder, piston and piston rings.
Care to be taken when installing piston into cylinder. Press piston rings in one by one as installation.

⚠ Caution

Do not push piston into cylinder forcefully because this will cause the piston and the piston rings to be damaged.



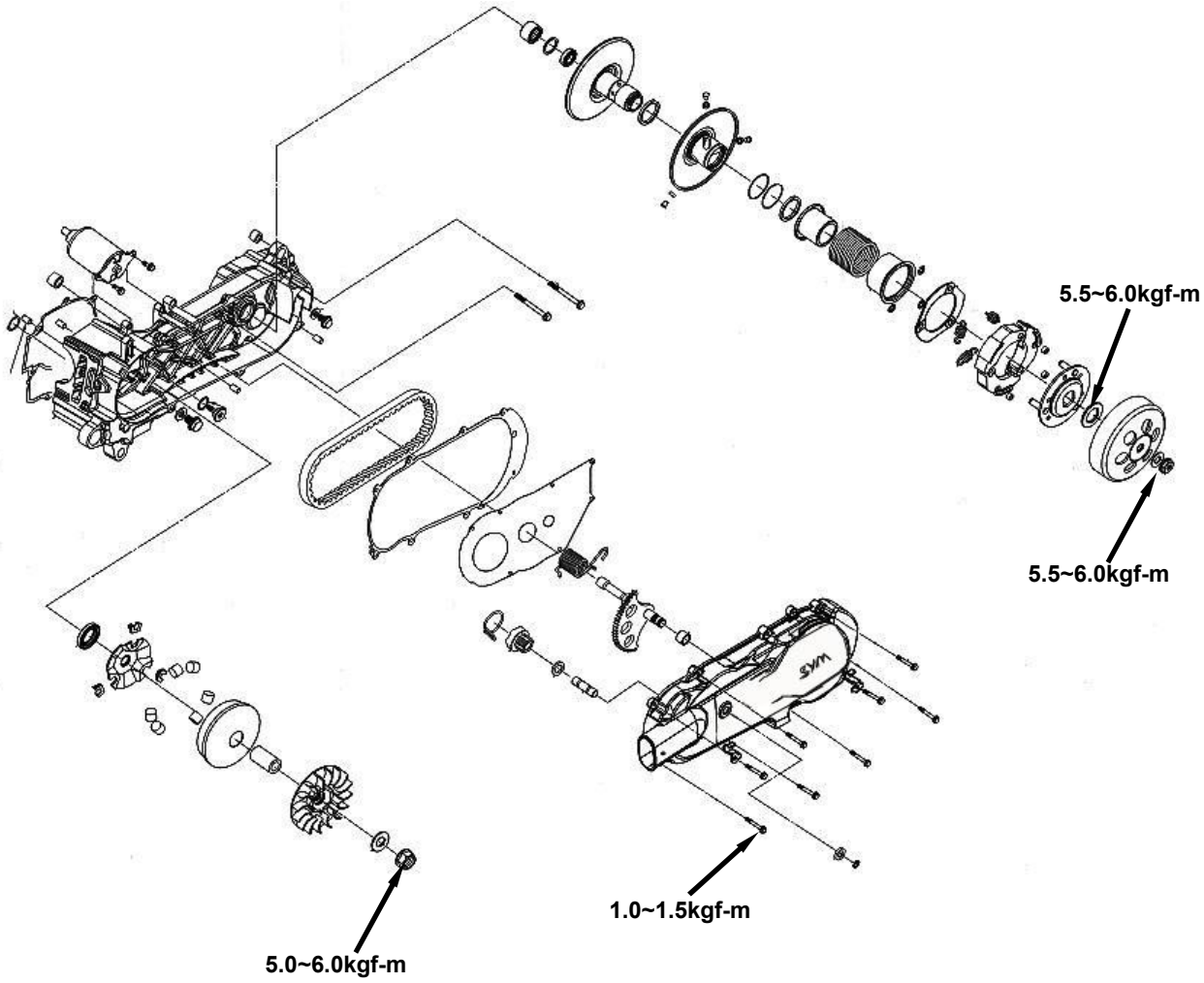
Install the cam chain plate, the cylinder head gasket and lock pins.
Install cylinder head. (refer to Chapter 6)
Install the cam chain auto-adjuster. (2 bolts)



8. V-BELT DRIVING SYSTEM/KICK STARTER

CONTENTS

MECHANISM DIAGRAM



8. V-BELT DRIVING SYSTEM/KICK STARTER

MAINTENANCE DESCRIPTION

Precautions in operation

General information

- Driving pulley, clutch, and driven pulley can be serviced on the motorcycle.
- Driving belt and driving pulley surface must be free of grease.

Specification

Unit: mm

Item	Standard value	Limit
Driving belt width	**19.50**	**18.50**
ID of sliding pulley bush	**23.989~24.052**	**24.060**
OD of sliding pulley hub	**23.960~23.974**	**23.940**
OD of roller	**15.92~16.08**	**15.400**
ID of clutch outer	**125.000~125.200**	**125.500**
Thickness of clutch lining	**3.000**	**2.500**
Free length of driving pulley spring	**168.900**	**163.700**
OD of driven pulley	**33.965~33.985**	**33.940**
ID of sliding pulley	**34.000~34.025**	**34.060**

ID: Inner Diameter
OD: Outer diameter

Torque value

Sliding pulley nut: 5.0~6.0kgf-m
Clutch outer nut: 5.5~6.0kgf-m
driving pulley nut: 5.5~6.0kgf-m

Special Service Tools

Clutch spring compressor
Bearing puller (inner type)
Clutch mounting nut wrench
Universal fixture

TROUBLE DIAGNOSIS

Engine can be started but motorcycle can not be moved

- Worn driving Belt
- Worn tilt plate
- Worn or damaged clutch lining
- Broken driven pulley

Shudder or misfire when driving

- Broken clutch lining
- Worn clutch lining

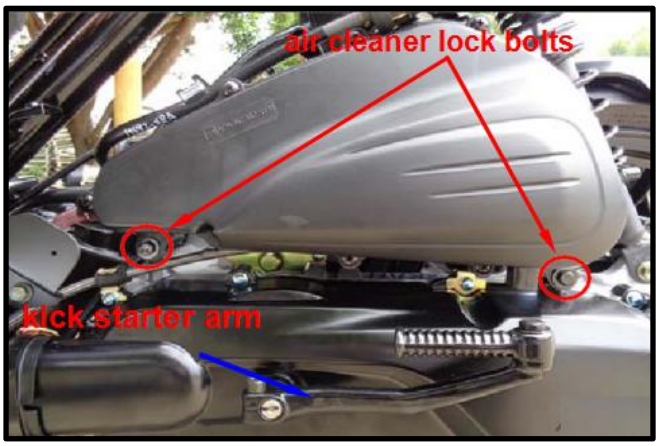
Insufficient horsepower or poor high speed performance

- Worn driving belt
- Insufficient spring capacity of driven pulley
- Worn roller
- Driven pulley operation un-smoothly

LEFT CRANKCASE COVER

Left crankcase cover removal

Remove air cleaner. (2 bolts)
Remove kick starter arm. (1 bolt)
Loosen vent strap on the front-left side of cover, and then remove the vent.
Remove engine left-side cover (8 bolts).



Installation of the left crankcase cover

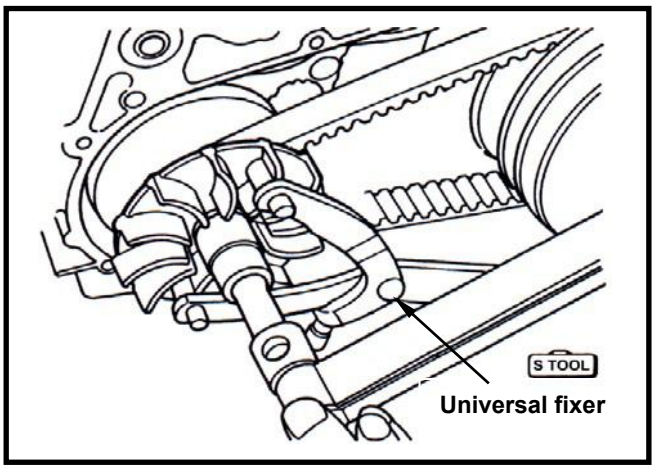
Install the left crankcase cover. (8 bolts)
Install front vent tube of left cover and tighten the strap.
Install kick starter arm. (1 bolt)
Tighten the air cleaner. (2 bolts)

DRIVING BELT

Removal

Remove left crankcase cover.

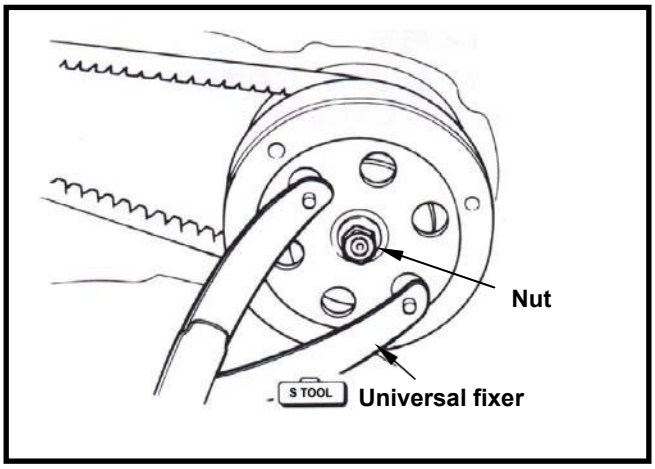
Hold the driving pulley with a universal fixture, and then remove the nut and driving pulley.



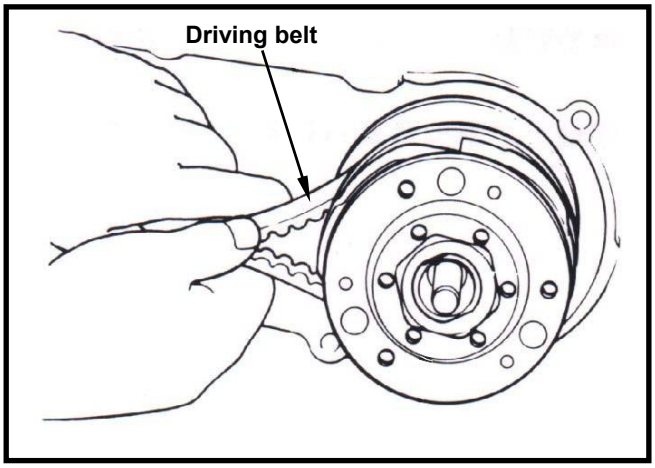
Hold driving pulley with universal fixture, and remove nut and clutch outer.

⚠ Caution

Using special service tools for tightening or loosening the nut. Fixed rear wheel or rear brake only will damage reduction gear system.



Push the driving belt into belt groove as diagram shown so that the belt can be loosened, and then remove driven belt and clutch at same time.



Inspection

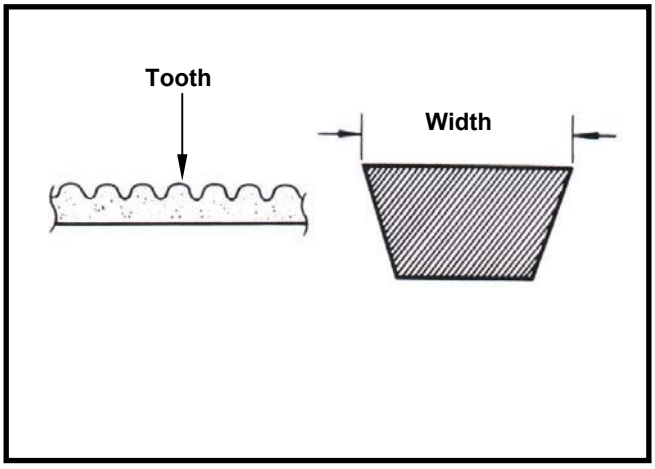
Check the driving belt for crack or wear. Replace it if necessary.

Measure the width of driving belt as diagram shown. Replace the driving belt if it exceed maintenance limited specification.

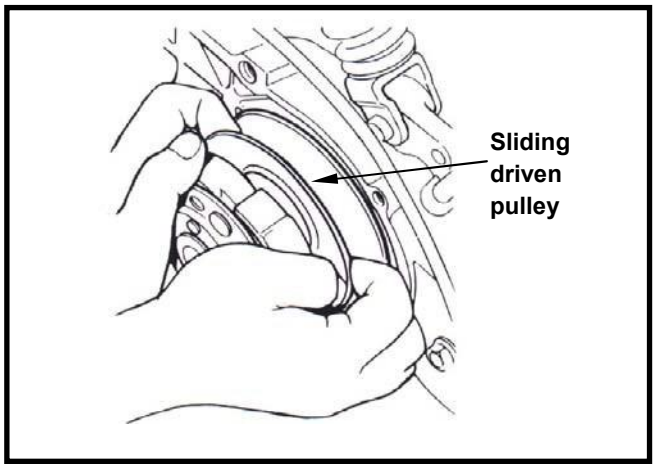
Service Limit: 18.5mm

⚠ Caution

- Using the genuine parts for replacement.
- The surfaces of driving belt or pulley must be free of grease.
- Clean up all grease or dirt before installation.



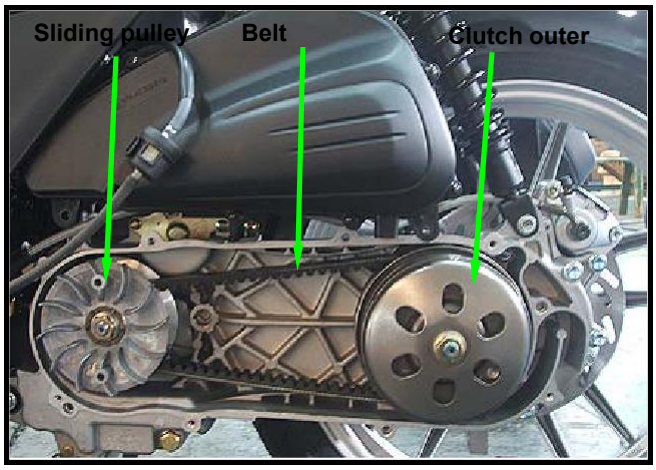
Installation
Pull out the driving pulley and then insert the driving belt into the driving pulley.



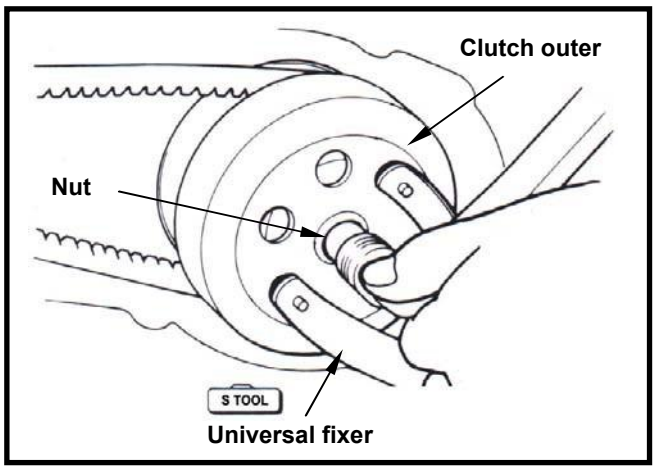
⚠ Caution

Pull out driving pulley and then insert the driving belt into the driving pulley so that the driving belt set can be installed onto sliding pulley more easily.

Install the clutch set with driving belt onto the driving shaft.
Install the sliding pulley on the other end of belt.
Install clutch outer.

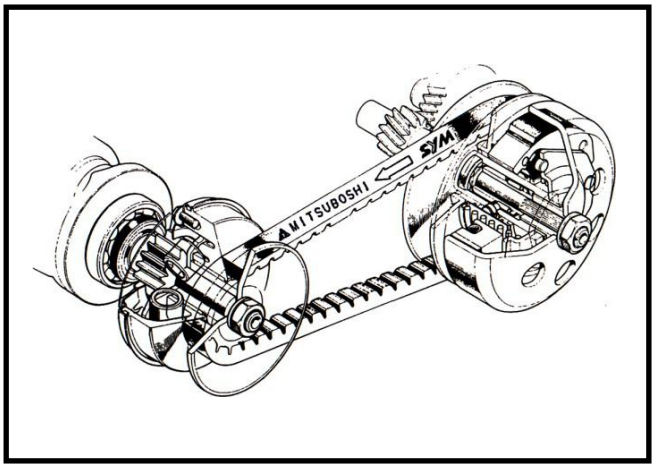


Install the clutch with universal fixture, and then tighten nut to specified torque value.
Torque value: 5.5~6.0 kgf-m



⚠ Caution

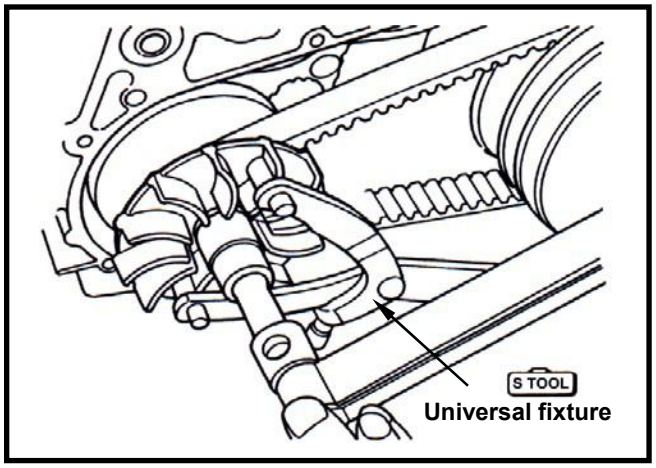
When install the driving belt, if there is a arrow mark, then the arrow mark must point to rotation motion. If not, the letters on the belt must be forwarded to assembly direction.



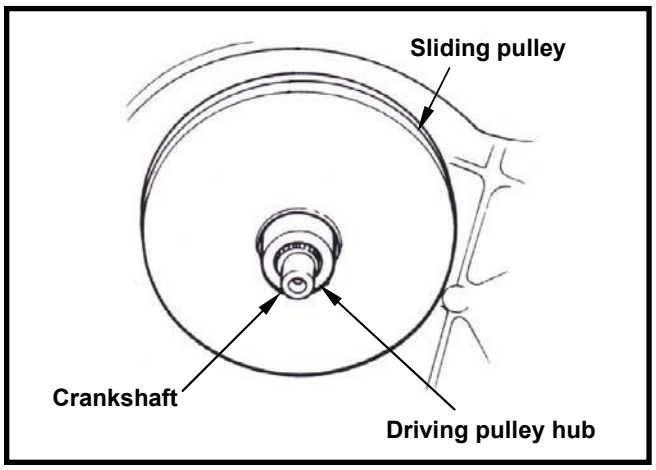
SLIDING PULLEY

REMOVAL

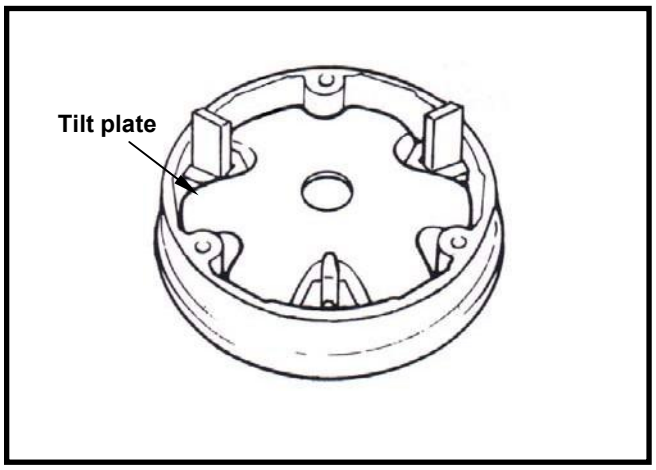
Remove left crankcase cover.
Hold driving pulley with universal fixture, and then remove driving pulley nut.
Remove driving pulley.



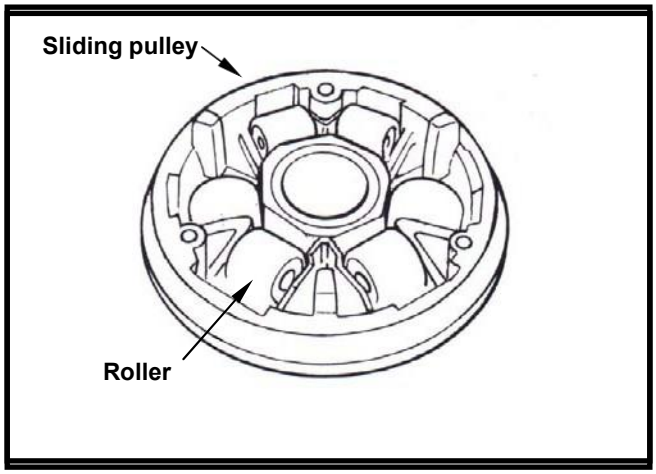
Remove the driving belt from the pulley.
Remove sliding pulley set and driving pulley hub from crankshaft.



Remove tilt plate.

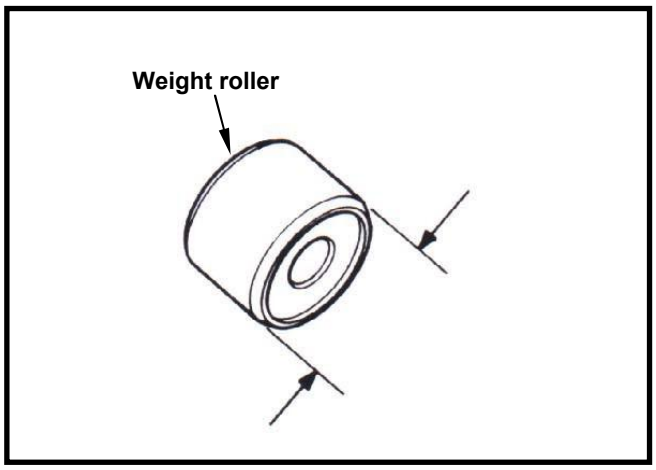


Remove weight rollers from sliding pulley.



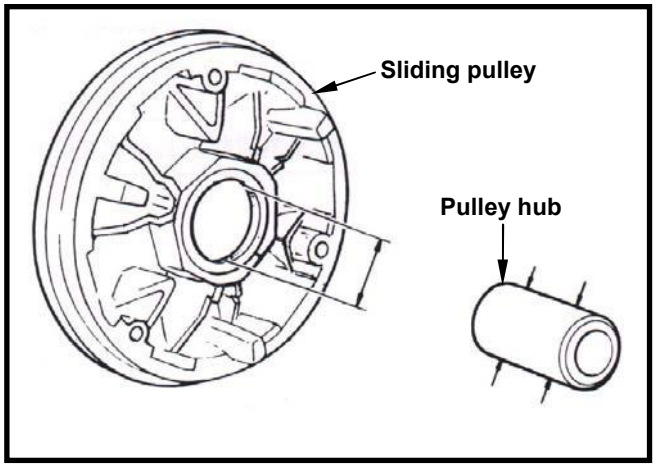
Inspection

The operation of sliding pulley is means of the weight roller to pressing on it with centrifuge force. And then the speed is changed by the title plate rotation. Thus, if weight rollers are wear out or damage, the centrifuge force will be effected.
Check if rollers are wear out or damage.
Replace it if necessary.
Measure each rollers' outer diameter.
Replace it if exceed the service limit.
Service limit: 15.40 mm



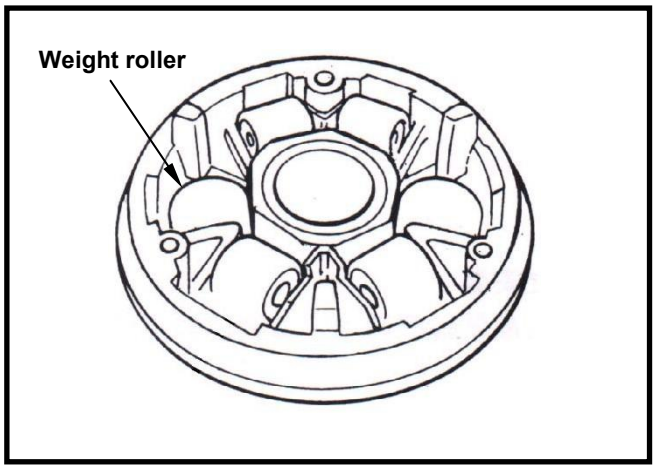
Check the pulley hub if damaged or wear out.
Replace it if necessary.
Measure the pulley hub's outer diameter.
Replace it if exceed the service limit.
Service limit: 23.94 mm

Measure the inner diameter of the pulley bush.
Replace it if exceed the service limit.
Service limit: 24.06 mm

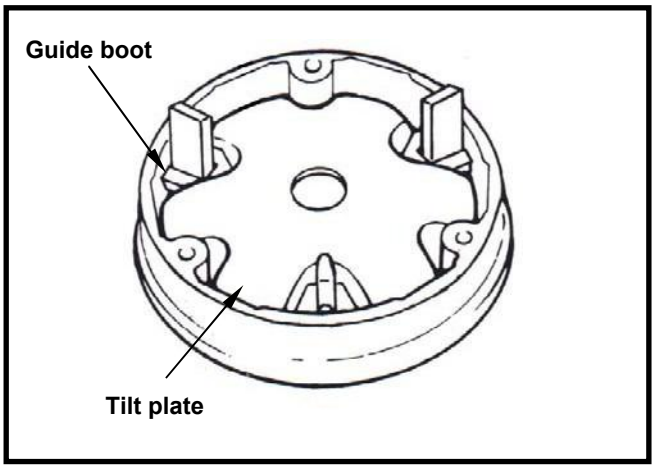


Assembly/Installation

Install the weight rollers.



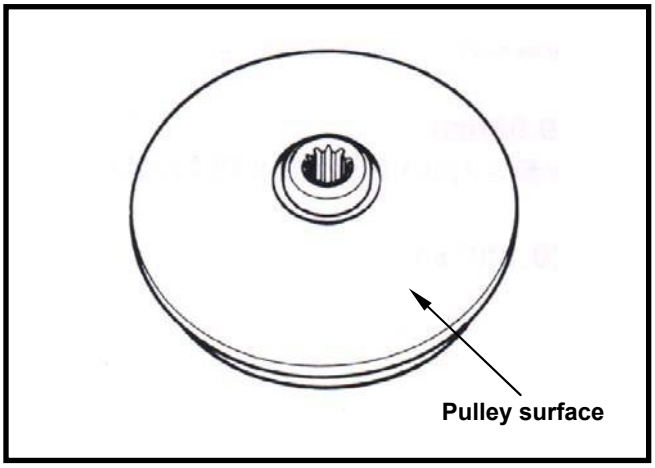
Install the title plate guide boot onto the title plate.
Install the title plate.



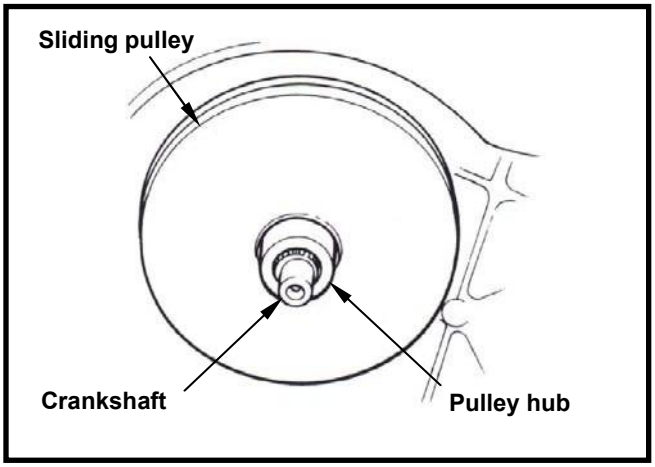
Apply with grease 4~5 g to inside of driving shaft hole, and install driving pulley hub.

⚠ Caution

The pulley surface has to be free of grease. Clean it with cleaning solvent.



Install siding pulley assembly onto crankshaft.

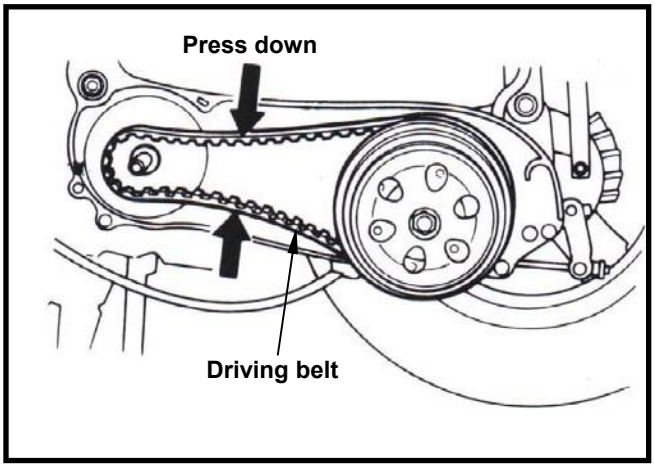


Driving pulley install

Press driving belt into pulley groove, and then press down the up & down sides of the driving belt to separate it away from the driving pulley hub.

⚠ Caution

To press down the up & down sides of the driving belt can avoid to pressing and damaging the belt when installing the driving pulley, and also can make sure that the driving pulley can be tighten.

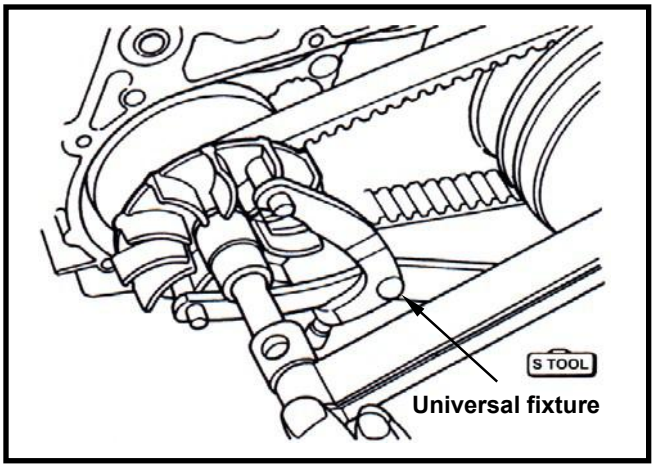


Install driving pulley, washer and nut.

⚠ Caution

Make sure that two sides of pulley surfaces have to be free of grease. Clean it with cleaning solvent.

Hold driving pulley with universal fixture.
Tighten nut to specified torque.
Torque value: 5.0~6.0 kgf-m
Install left crankcase cover.



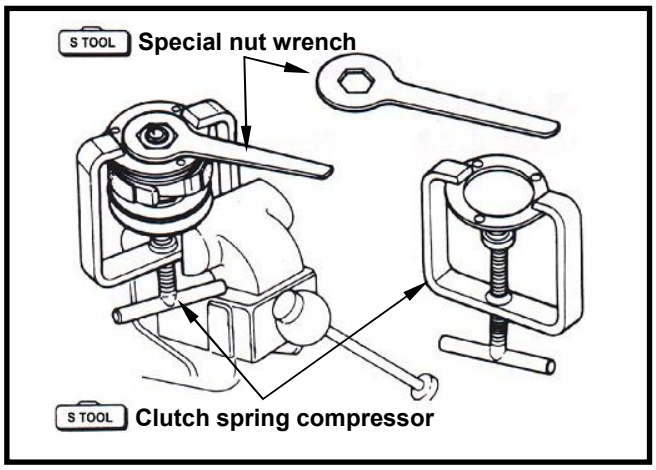
CLUTCH/DRIVEN PULLEY

Disassembly

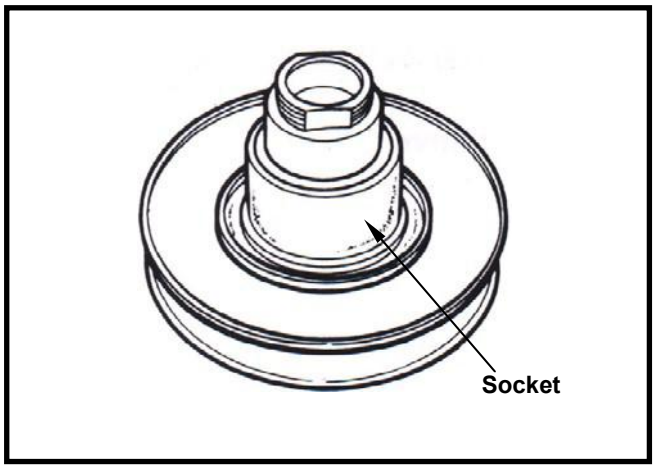
Remove driving belt and clutch/driven pulley.
Install clutch spring compressor onto the pulley assembly, and operate the compressor to let nut be installed more easily.

⚠ Caution

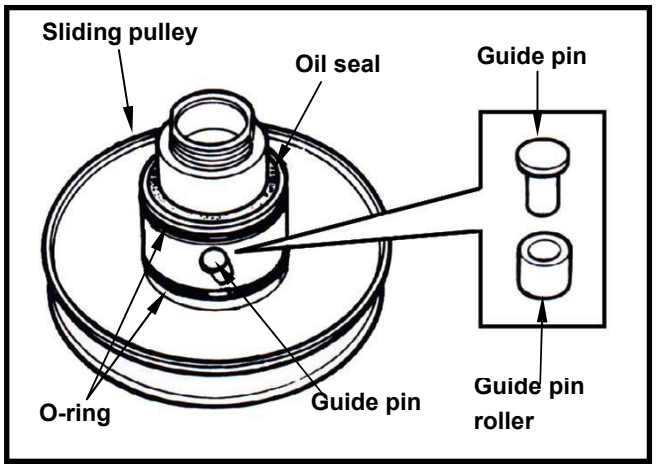
Do not press the compressor too much.



Hold the clutch spring compressor onto bench vise, and then remove mounting nut with special nut wrench.
Release the clutch spring compressor and remove clutch and spring from driven pulley.
Remove socket from driven pulley.



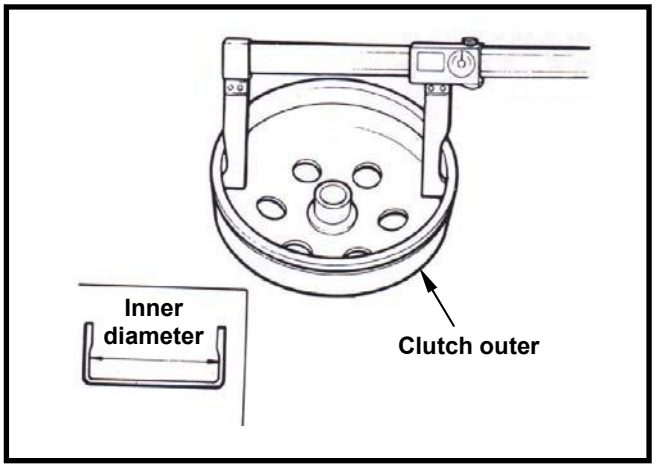
Remove oil seal from driven pulley.
Remove guide pin, guide pin roller, and sliding pulley, and then remove O-ring & oil seal seat from sliding pulley.



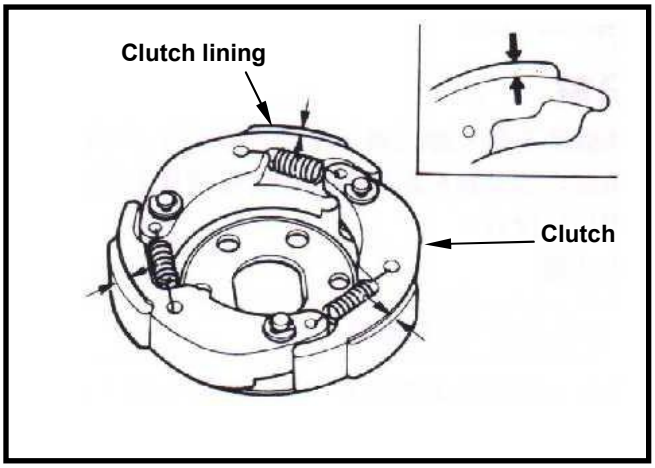
Inspection

Clutch outer

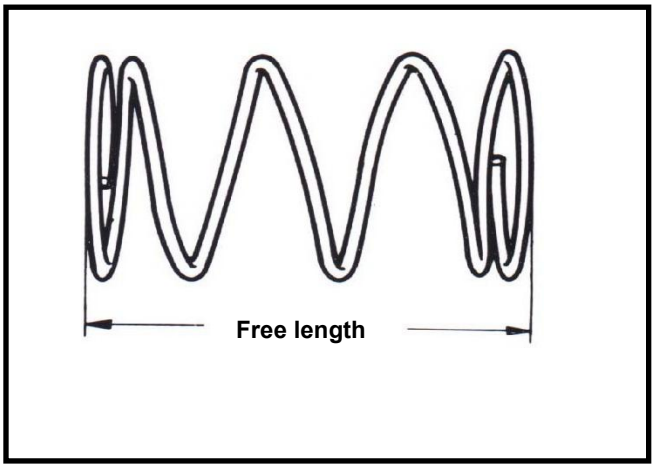
Measure the inner diameter of clutch outer friction face. Replace the clutch outer if exceed service limit.
Service limit: 125.5 mm



Clutch lining
Measure each clutch lining thickness.
Replace it if exceeds service limit.
Service limit: 2.5mm

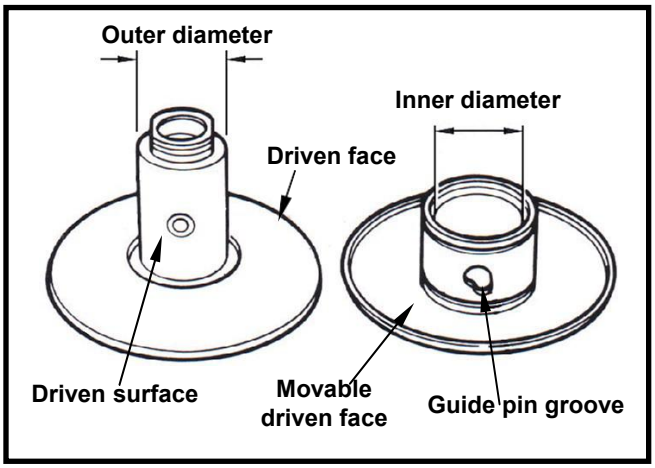


Driven pulley spring
Measure the length of driven pulley spring.
Replace it if exceeds service limit.
Service limit: 163.7mm

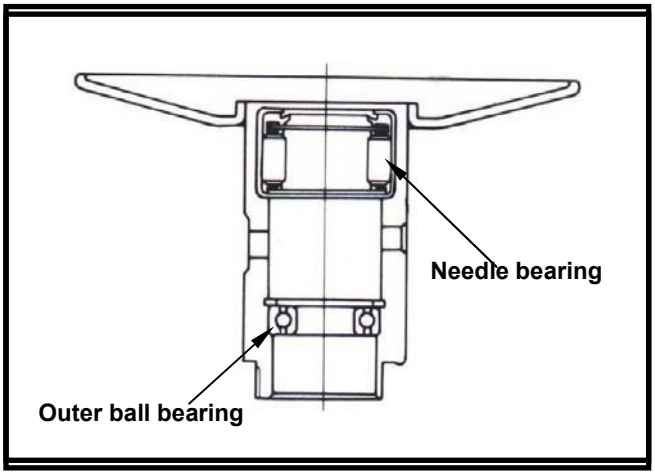


Driven pulley
Check following items;
- If both surfaces are damage or wear.
- If guide pin groove is damage or wear.

Replace damaged or worn components.
Measure the outer diameter of driven face and the inner diameter of movable driven face. Replace it if exceeds service limit.
Service limit: Outer diameter 33.94mm
Inner diameter 34.06mm

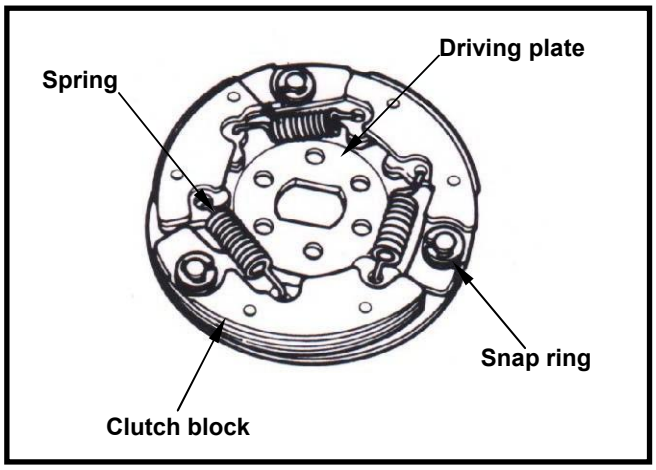


Driven Pulley Bearing Inspection
Check if the inner bearing oil seal is damage. Replace it if necessary.
Check if needle bearing is damage or too big clearance. Replace it if necessary.
Rotate the inside of inner bearing with fingers to check if the bearing rotation is in smooth and silent.

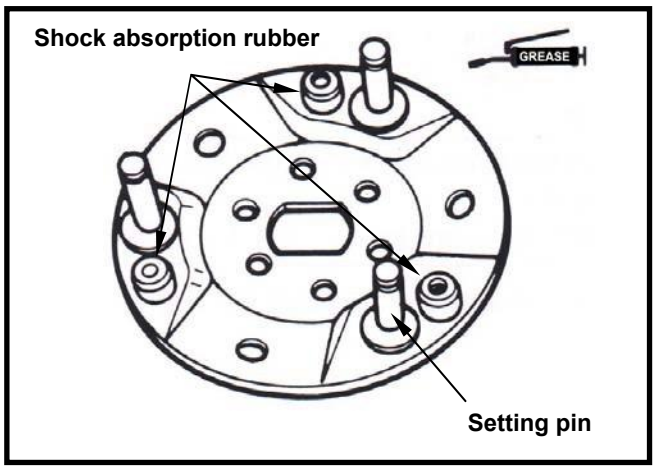


Clutch Block Replacement

Remove snap and washer, and the remove clutch block and spring from driving plate. Check if spring is damage or insufficient elasticity.



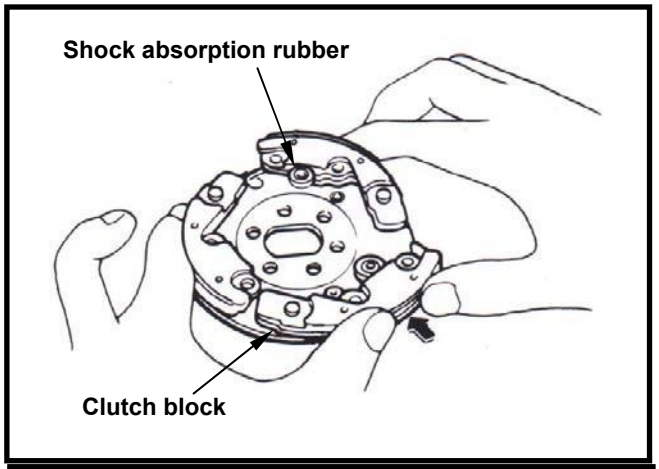
Check if shock absorption rubber is damage or deformation. Replace it if necessary. Apply with grease onto setting pins.



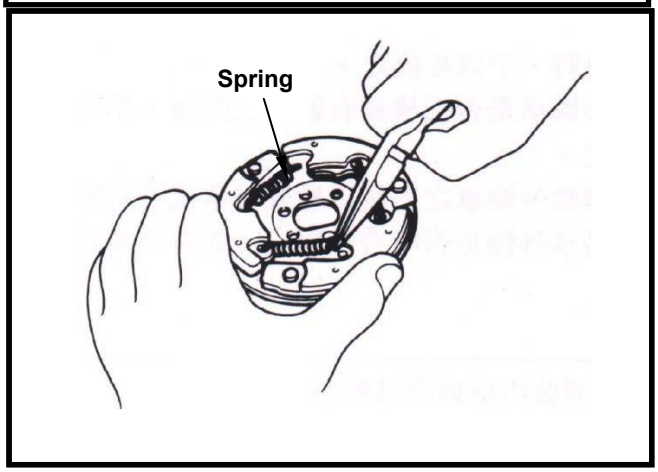
Apply with grease onto setting pins. But, the clutch block should not be greased. If so, replace it.
Install new clutch block onto setting pin and then push to specified location.

⚠ Caution

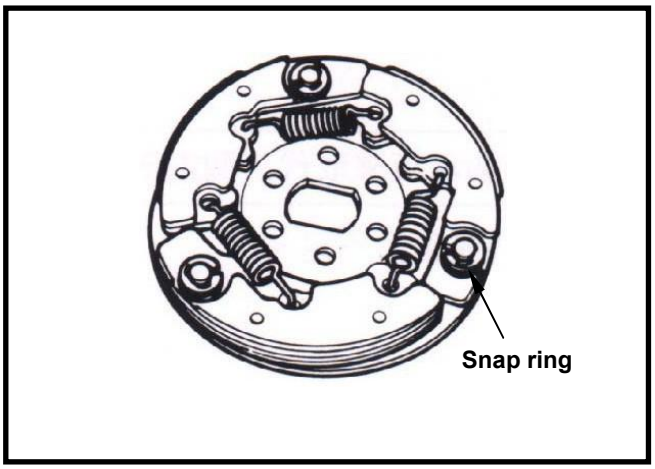
- Grease or lubricant will damage the clutch block and effect the block's connection capacity.



Install the spring snap into groove with pliers.



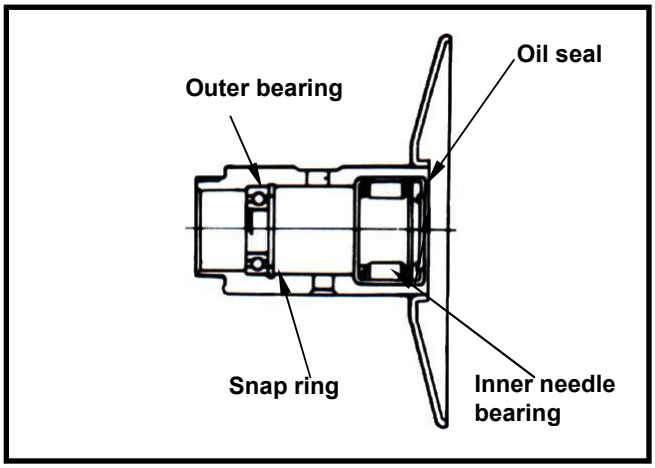
Install snap ring and mounting plate onto setting pin.



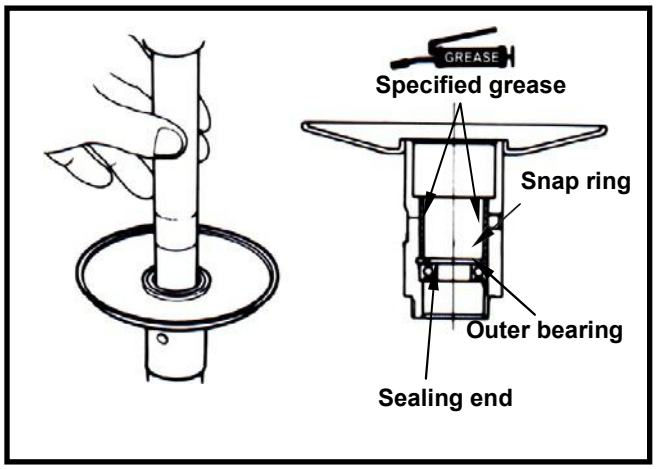
Replacement of driven pulley bearing
Remove inner bearing.

⚠ Caution

- If the inner bearing equipped with oil seal on one side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.



Remove snap ring and then push bearing forward to other side of inner bearing.
Place new bearing onto proper position and its sealing end should be forwarded to outside.
Apply with specified grease.
Recommended to use the KING MATE G-3.
Install the snap ring and hold the bearing.

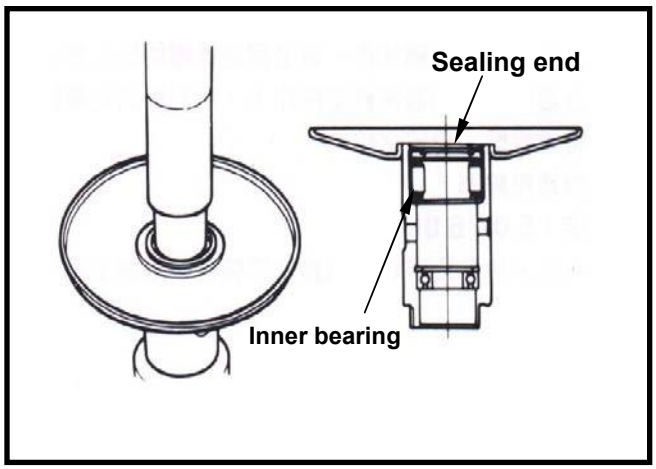


Install a new inner bearing.

⚠ Caution

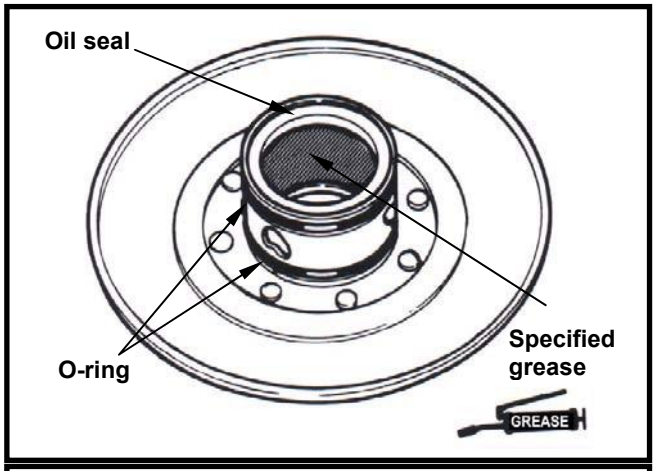
- Its sealing end should be forwarded to outside as bearing installation.
- Install needle bearing with hydraulic presser. Install ball bearing by means of hydraulic presser.

Align oil seal lip with bearing, and then install the new oil seal (if necessary).

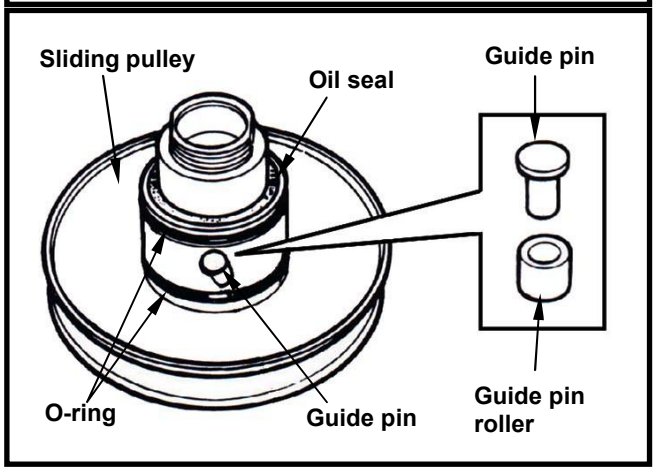


Installation of clutch/driven pulley

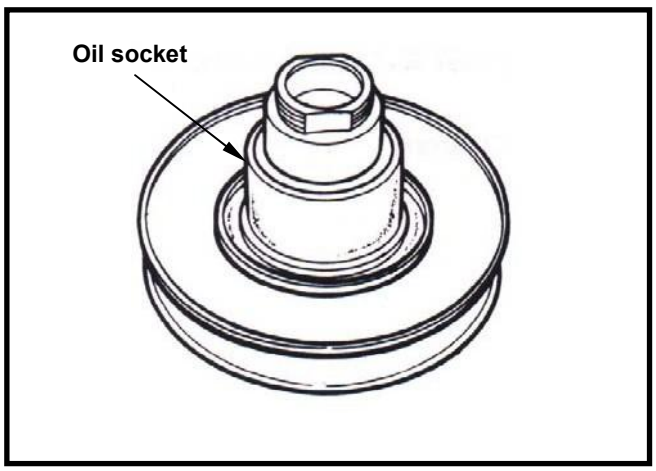
Install new oil seal and O-ring onto sliding pulley.
Apply with specified grease to lubricate the inside of sliding pulley.



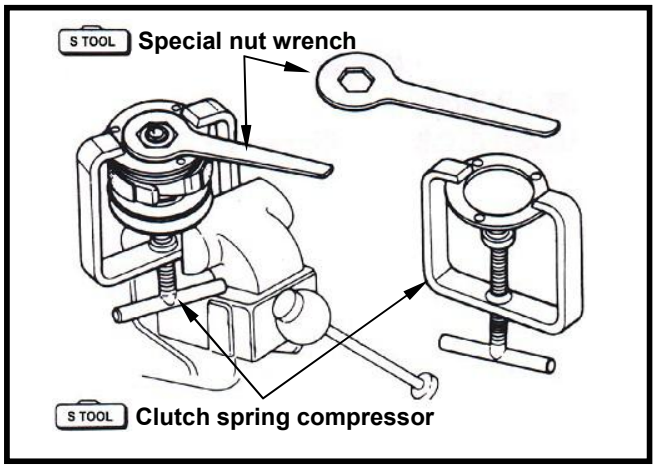
Install sliding pulley onto driven pulley.
Install guide pin and guide pin roller.



Install oil socket.



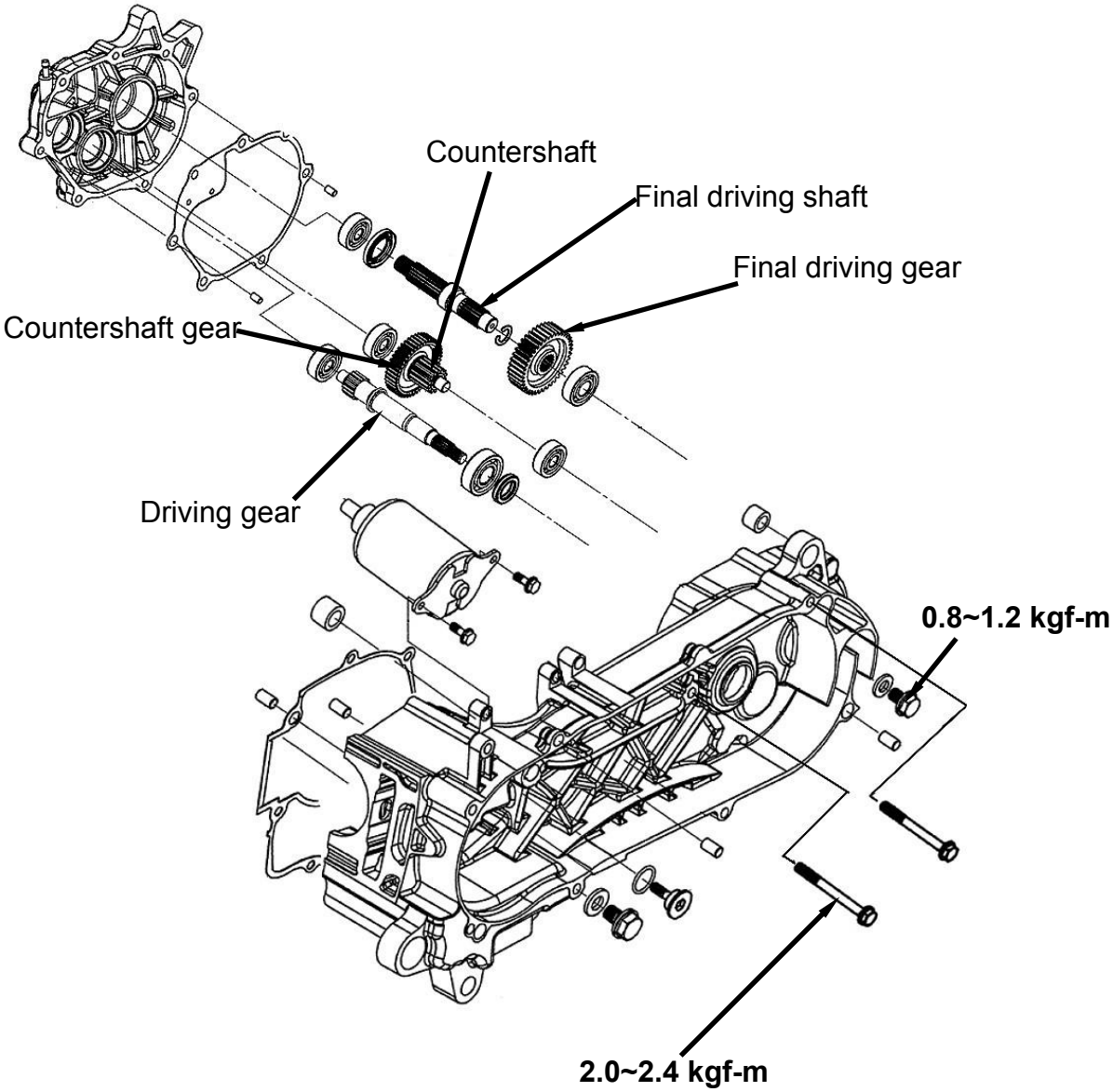
Install driven pulley, spring and clutch into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.
Hold the compressor by bench vise and tighten the mounting nut to specified torque with special nut wrench.
Remove the clutch spring compressor.
Torque value: 5.5~6.0 kg-m
Install clutch/driven pulley and driving belt on to driving shaft.



9. FINAL DRIVING MECHANISM

CONTENTS

MECHANISM DIAGRAM



9. FINAL DRIVING MECHANISM

OPERATIONAL PRECAUTIONS

Specification

Application gear oil: 4-stroke lubricant
Recommended gear oil:85W-90
Oil quantity: 130 c.c. (110 c.c. when replacing)

Torque value

Gear box cover	0.8~1.2 kgf-m
Gear oil drain plug	1.0~1.4 kgf-m
Gear oil filling bolt	0.8~1.2 kgf-m

Tools

Special service tools

Inner type bearing puller
Outer type bearing puller
Gear box oil seal installer
Gear box bearing installer

TROUBLE DIAGNOSIS

Engine can be started but motorcycle can not be moved

- Damaged driving gear
- Burnt out driving gear
- Broken driving belt

Noise

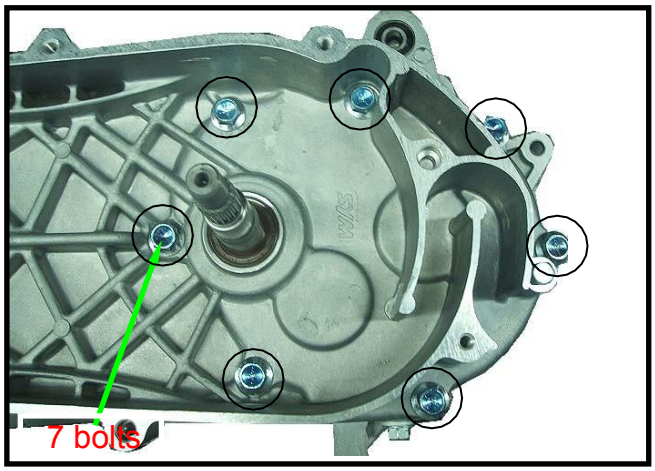
- Worn or burnt gear
- Worn gear

Gear oil leaks

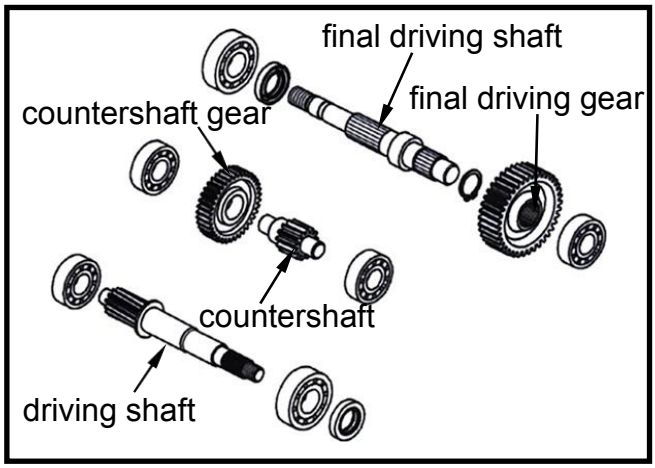
- Excessive gear oil
- Worn or damage oil seal

DISASSEMBLY OF FINAL DRIVING MECHANISM

Remove the rear wheel. (refer to chapter 15)
Remove the clutch.
Drain gear oil out from gear box.
Remove gear box cover bolts (7bolts) and then remove the cover and the final driving shaft.
Remove gasket and setting pin.

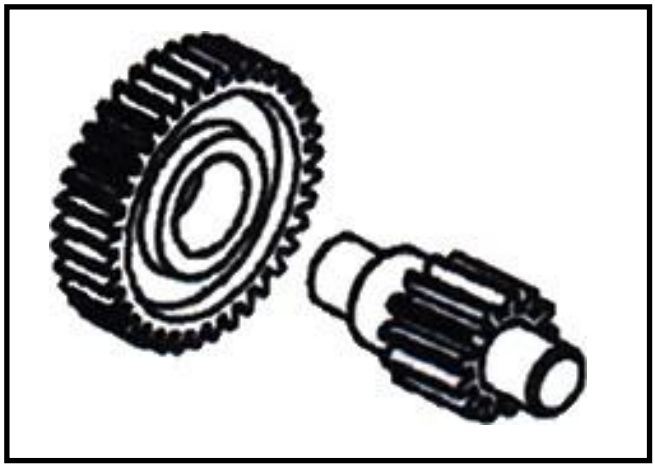


Remove countershaft and gear.
Remove final driving gear and shaft.

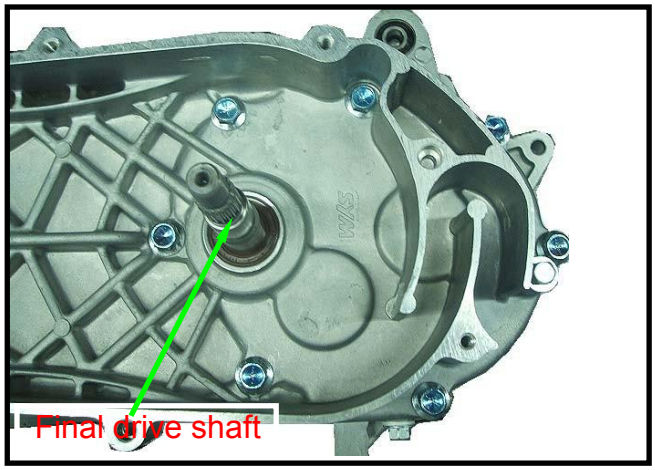


INSPECTION OF FINAL DRIVING MECHANISM

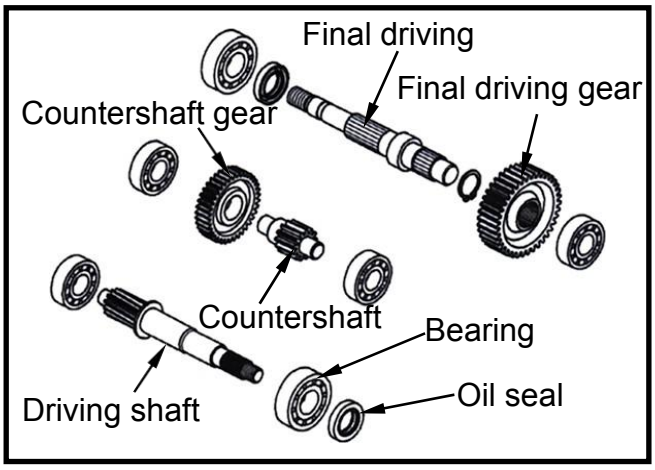
Check if the countershaft and the gear are wear or damage.



Check if the final driving shaft and gear are burn, wear or damage.



Check bearings on gear box and cover. Rotate each bearing's inner ring with fingers. Check if bearings can be turned in smooth and silent, and also check if bearing outer ring is mounted on gear box & cover tightly. If bearing rotation is uneven, noising, or loose bearing mounted, then replace it. Check oil seal for wear or damage, and replace it if necessary.



⚠ Caution

- Do not remove the driving shaft from the cover top side.
- If remove the driving shaft from the cover top side, then its bearing has to be replaced.

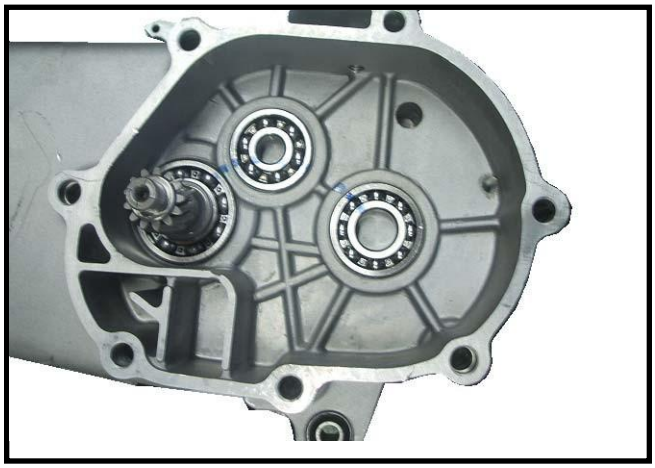
Check driving shaft and gear for wear or damage.

BEARING REPLACEMENT

⚠ Caution

Never install used bearings. Once bearing removed, it has to be replaced with new one.

Remove driving shaft bearing from left crankcase using following tools;
Inner type bearing puller



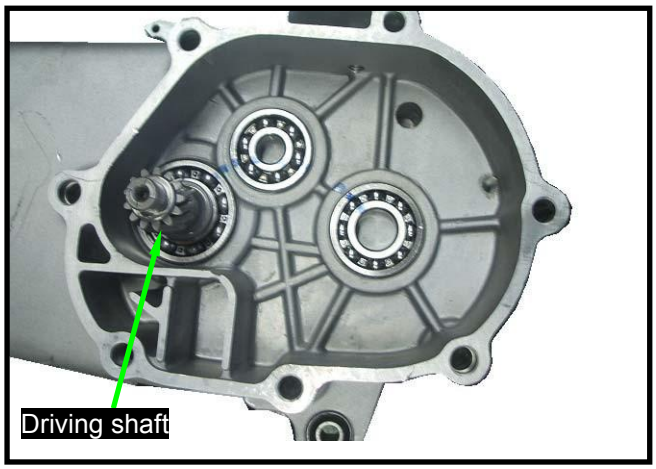
Install new driving shaft bearing into left crankcase.
Tool:
Press the bearing into cover with C type hydraulic presser or bearing installer.

Press out the driving shaft from the crankcase.
Remove oil seal from the gear box.
Remove the driving shaft bearing from the gear box cover with the inner type bearing puller.

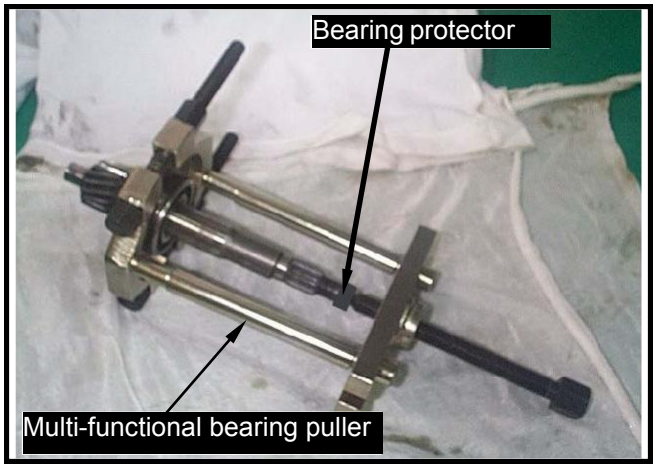
⚠ Caution

Using the bearing protector as pressing out the driving shaft from the left crankcase.

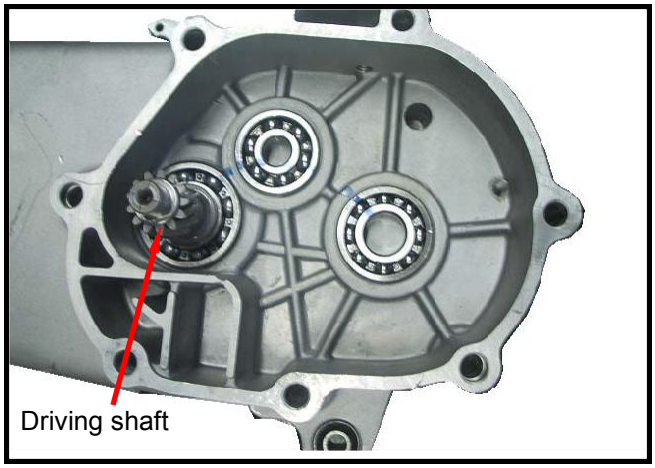
Specified tool:
Inner type bearing puller.



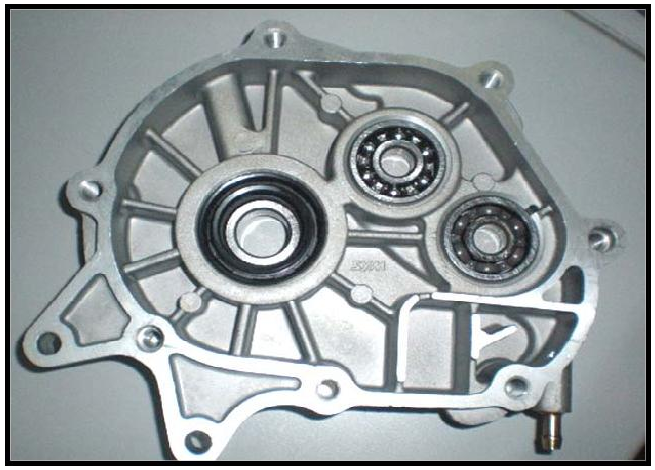
If the driving shaft is pulled out with its bearing, then remove the bearing with bearing puller and bearing protector.
Tool:
Multi-functional bearing puller
Bearing protector



Install a new driving shaft bearing onto crankcase.
Then, install the driving shaft.
Specified tool:
Press the bearing in with C type hydraulic presser or bearing installer.

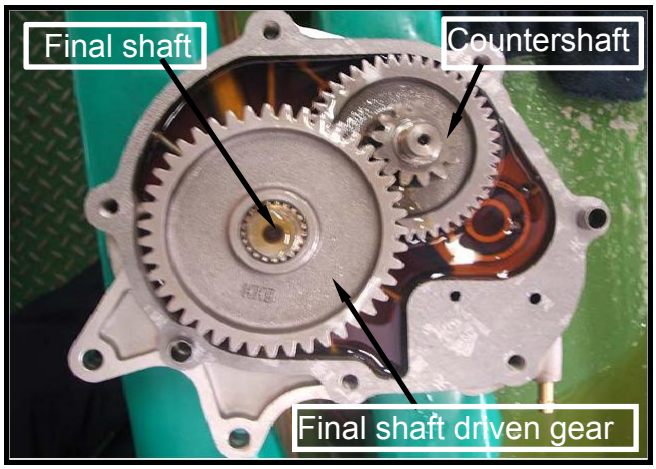


Install a new final driving shaft bearing onto gear box cover.
Specified tool:
Press the bearing in with C type hydraulic presser or the bearing installer.
Apply with some grease onto the lip section of oil seal and then install the seal.

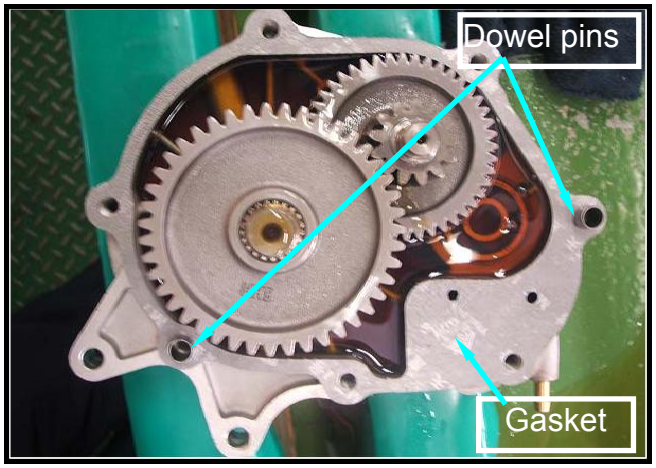


RE-ASSEMBLY OF FINAL DRIVING MECHANISM

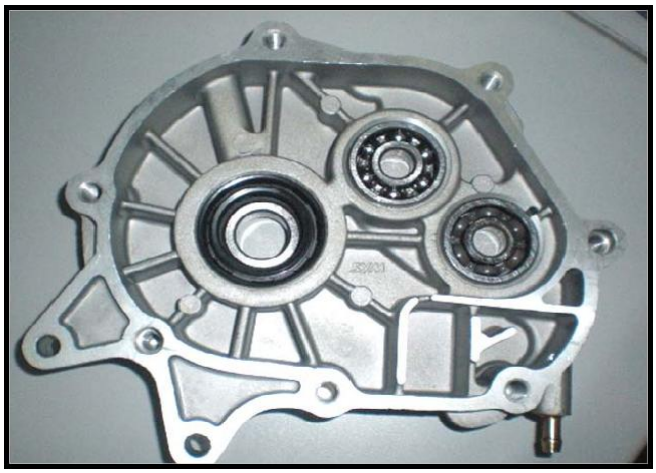
Install final shaft and final shaft driven gear, countershaft.

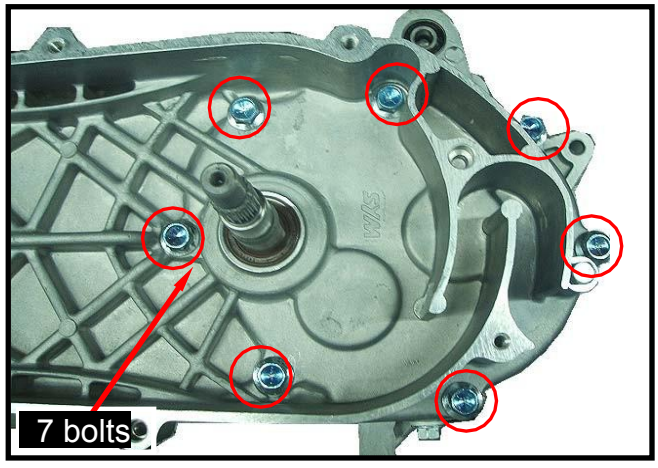


Install the setting pins(2 pins) and new gasket.



Apply with grease onto the oil seal lip of final driving shaft.
Install the gear box cover and 7 bolts. (tighten the bolts)
Torque: 0.8~1.2 kgf-m
Install the clutch/sliding driving pulley.
Install the driving pulley, belt and left crankshaft cover.
Install the rear wheel.
Add gear oil.
Recommended usage: SGL 85W-90
(0.13 L: standard capacity)
(0.11 L: when replacement)

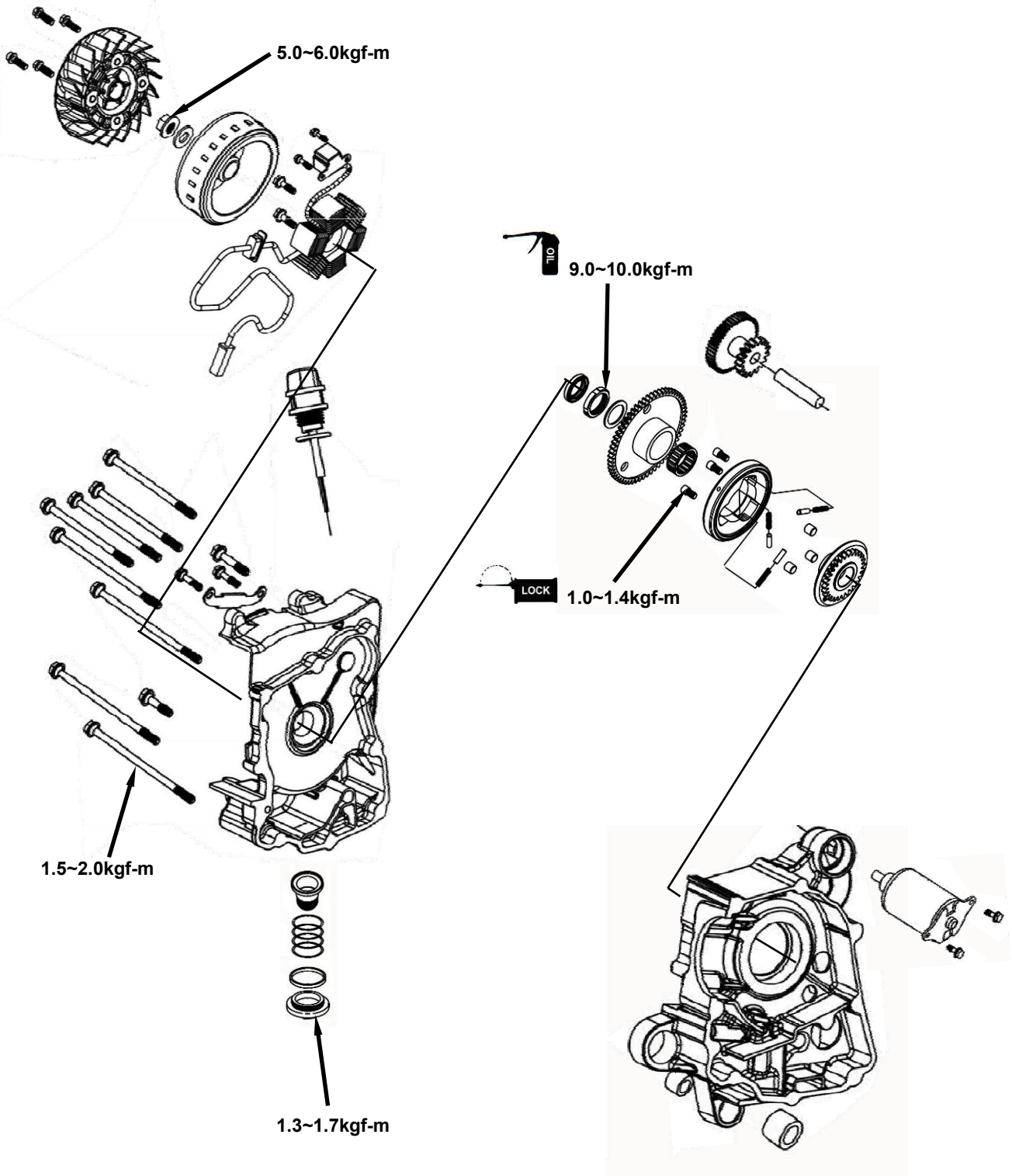




10. A.C. GENERATOR/STARTING CLUTCH

CONTENTS

MECHANISM DIAGRAM



10. A.C. GENERATOR/STARTING CLUTCH

PRECAUTIONS IN OPERATION

General information

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 1: The troubleshooting and inspection of A.C. generator
- Refer to chapter 16: The service procedures and precaution items of starter motor

Specification Unit: mm

Item	Standard value	Service Limit
ID of starting driven gear	32.0	32.060
OD of starting clutch cover	28.0	27.940

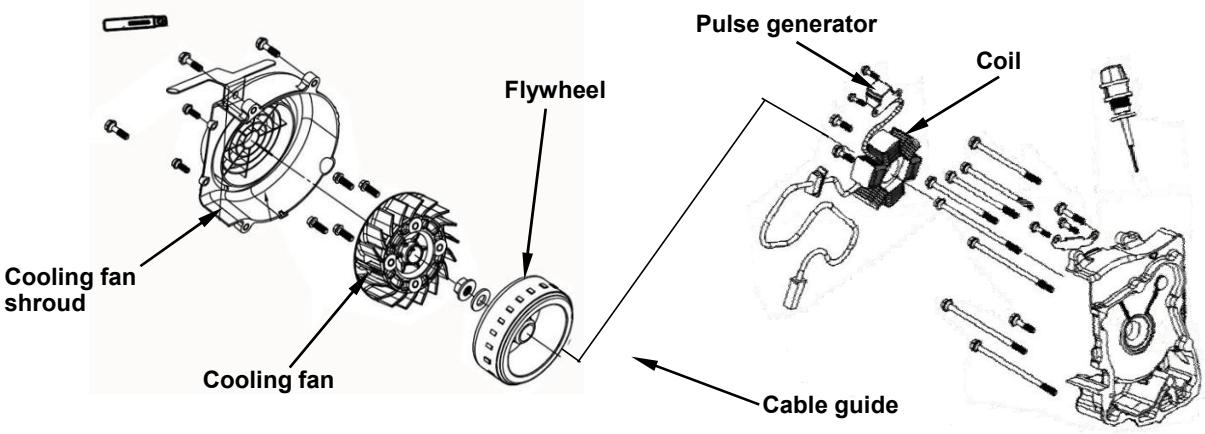
Torque value:

Flywheel nut	5.0~6.0kgf-m
Exhaust muffler bolt 8 mm	1.5~2.0kgf-m
Oil screen cover	1.3~1.7kgf-m
Starting clutch hex lock nut	9.0~10.0kgf-m with oil on the thread
Starting clutch hex socket bolt	1.0~1.4kgf-m with adhesive

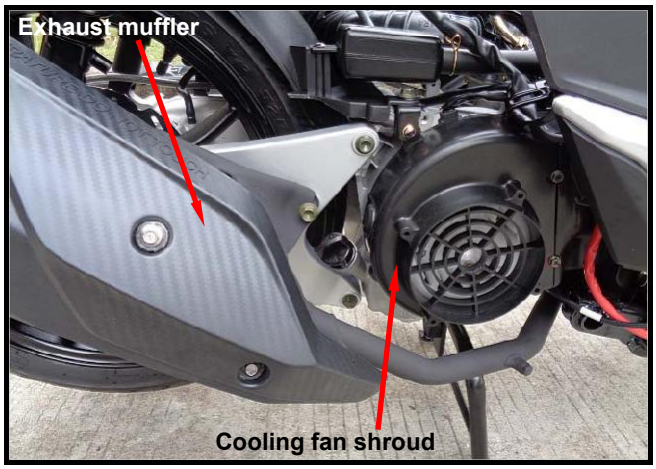
Special service tools

Flywheel puller
Universal fixture

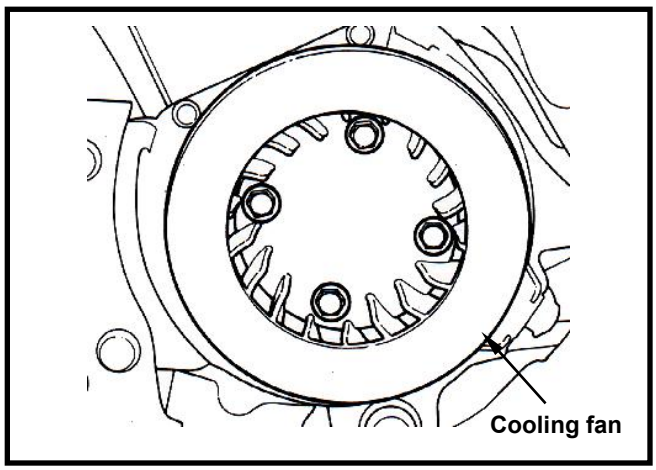
A.C. GENERATOR REMOVAL



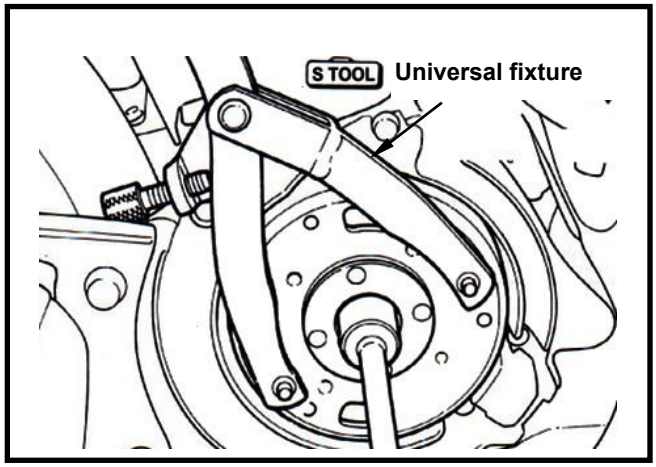
Drain out the engine oil.
Remove the body cover.
Remove the exhaust muffler. (3 bolts, 2 nuts)
Remove the fan shroud. (5 bolts)



Remove the fan. (4 bolts)



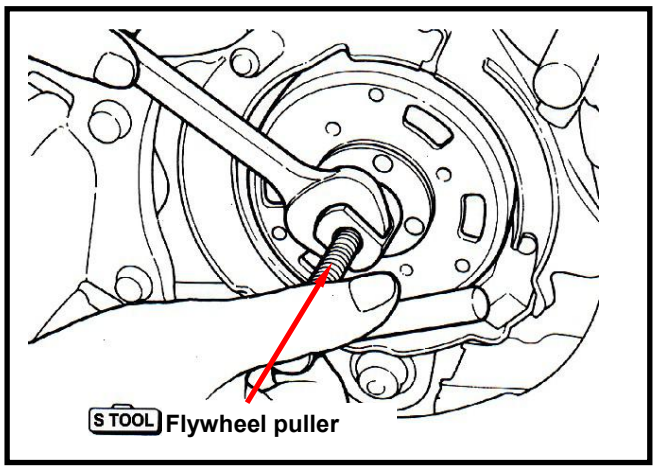
Hold the flywheel with the universal fixture.
Remove the 10mm nut on the flywheel.
Special Service Tools:
Universal Fixture



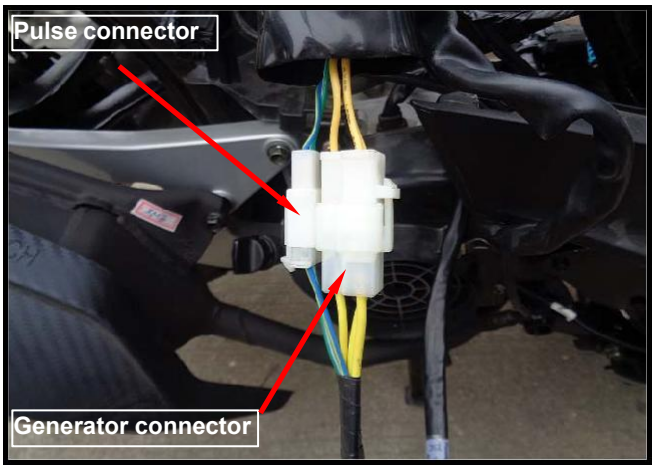
Remove the flywheel with the flywheel puller.
Special service tools:
Flywheel puller
Shaft protector

⚠ Caution

Install a shaft protector on the right end of crankshaft to avoid damaging the crankshaft before installing the flywheel puller.



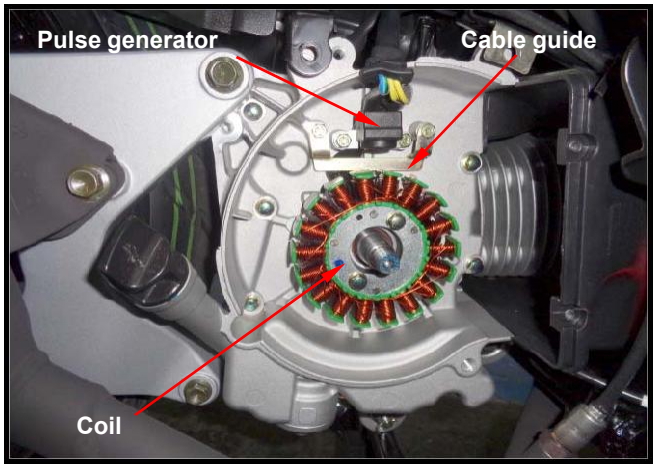
Remove the connectors of the A.C. generator and pulse generator.



Remove the 6 bolts for the pulse generator, the A.C. generator coil and cable guide. Then, remove the A.C. generator assembly.

⚠ Caution

Do not damage the alternator coil.

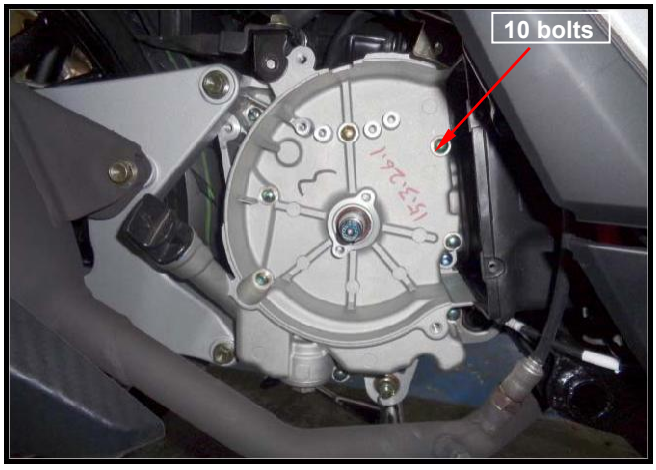


RIGHT CRANKCASE COVER REMOVAL

Remove the right crankcase cover(10 bolts)
Remove setting pin and gasket.
Remove the gasket or foreign materials on the connection surfaces of both the cover and crankcase.

⚠ Caution

Do not damage the connection surfaces.



STARTING CLUTCH

Starting Clutch Removal

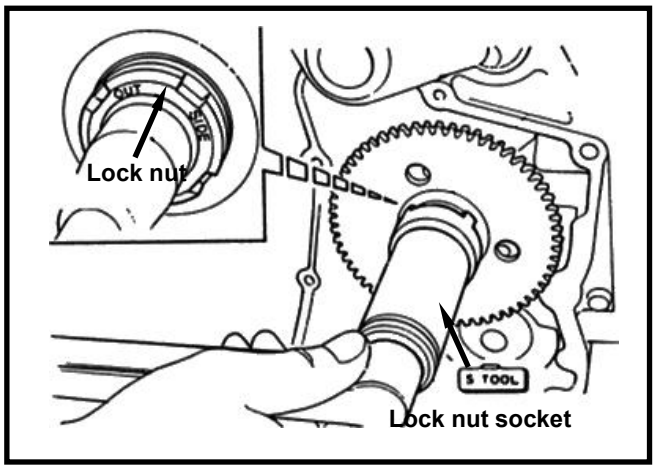
Hold the starting driven gear with the universal fixture.

Remove the 22mm anti-loosen lock nut and gasket.

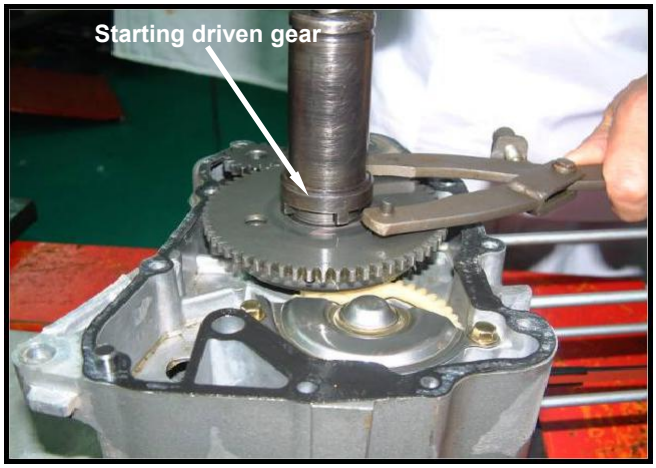
Special service tools:
Anti-loosen lock nut socket
Universal fixture.

⚠ Caution

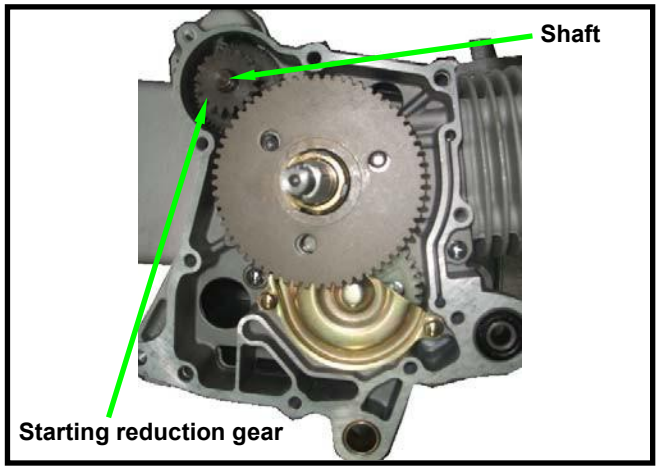
The mounting nut is left-turn thread.



Remove the starting driven gear.



Remove starting clutch, starting reduction gear, and shaft.

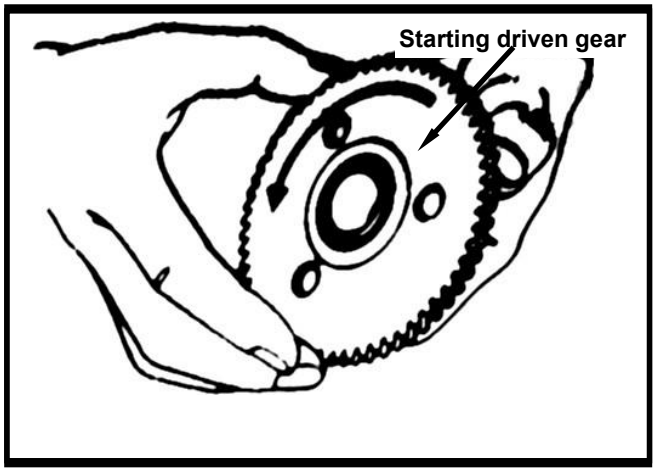


Starting Clutch Inspection

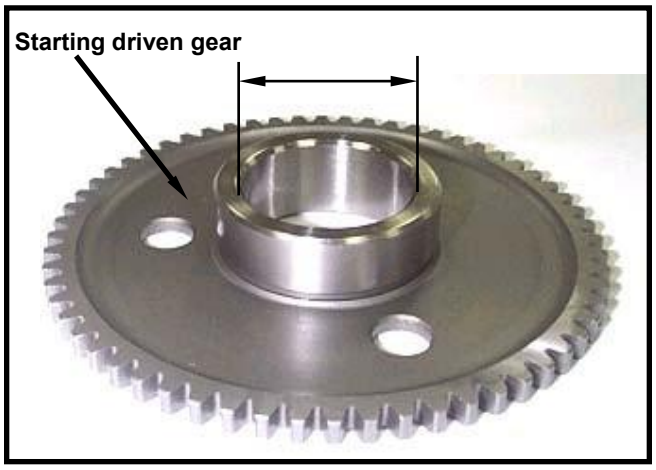
Install the starting clutch onto the starting driven gear.

Hold the starting clutch and turn the starting driven gear.

The starting driven gear should can be turned in the motion of C.W. and can not be turned in C.C.W.

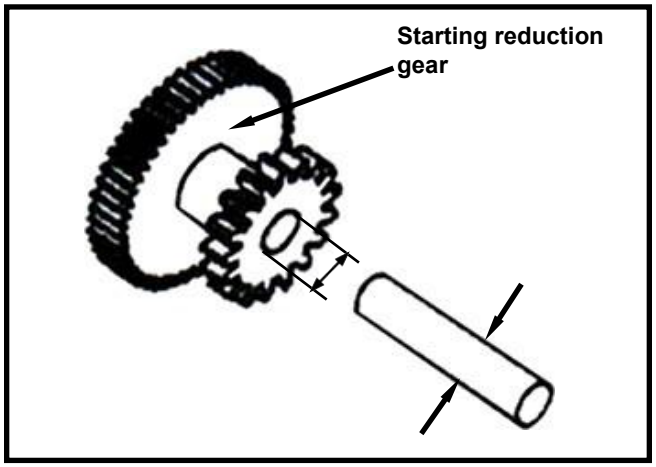


Check the starting driven gear for wear or damage.
Measure the ID of the starting driven gear.
Service Limit:
ID: 32.06 mm or less

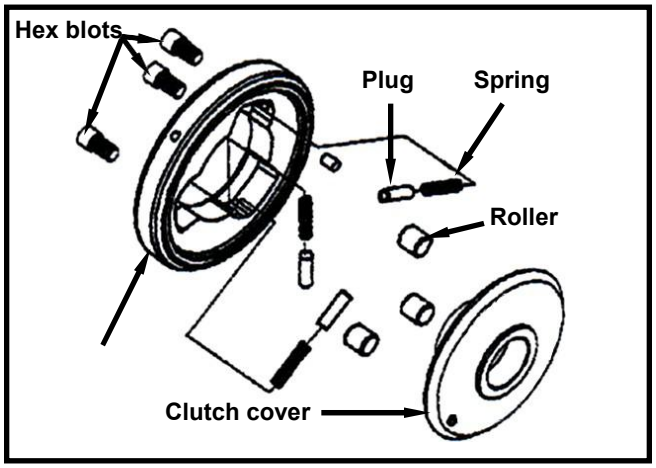


Check the starting reduction gear and shaft for wear or damage.
Measure the ID of the starting reduction gear.
Service Limit:
ID: 10.05 mm or less

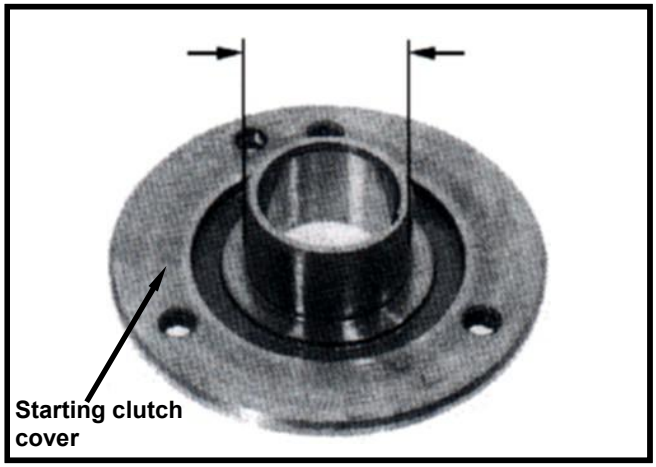
Measure the OD of the starting reduction gear shaft.
Service Limit:
OD: 9.94 mm or above



Disassembly
Remove the hex blots (3 bolts) inside the starting clutch.
Separate the clutch body and the clutch cover.
Remove the rollers, plugs, and springs on the one way clutch.
Check each rollers and plugs for wear or damage.
Install rollers, plugs and springs.



Measure the OD of the starting clutch cover.
Service Limit:
OD: 27.94 mm or above

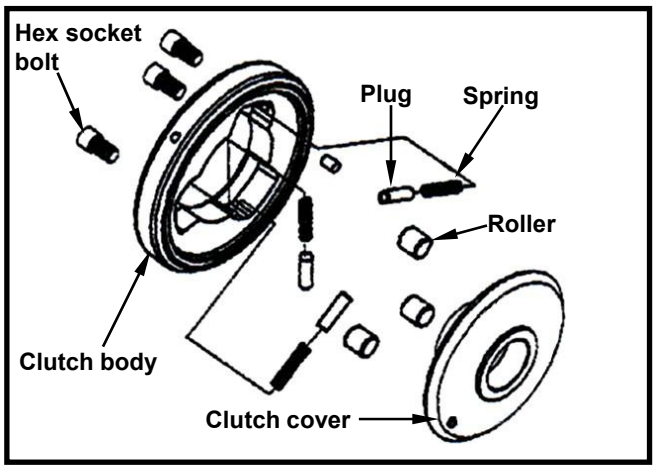


Installation
Install the components in the reverse procedures of removal.

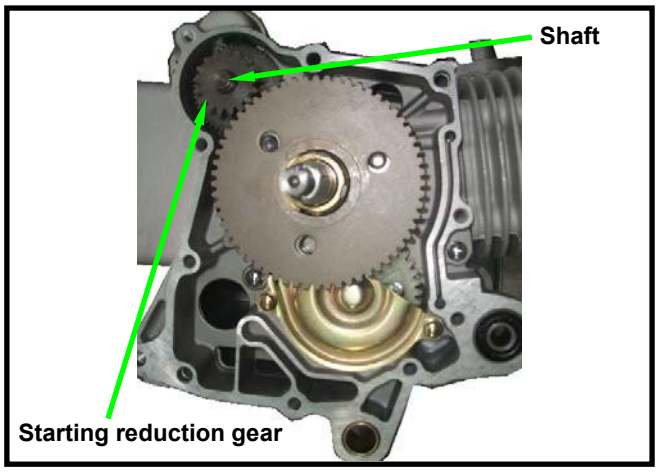
⚠ Caution

Add adhesive onto the thread of hex socket bolt.

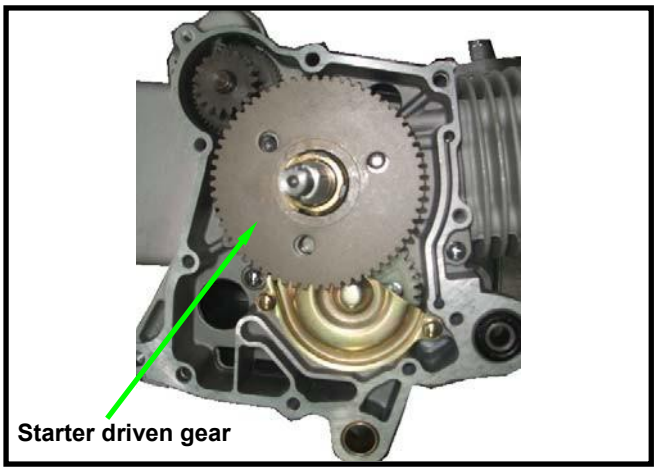
Torque value: 1.0~1.4kgf-m



Starting clutch Installation
Install reduction gear shaft and reduction gear.
Install starting clutch.



Install the starting clutch outer and starter driven gear.

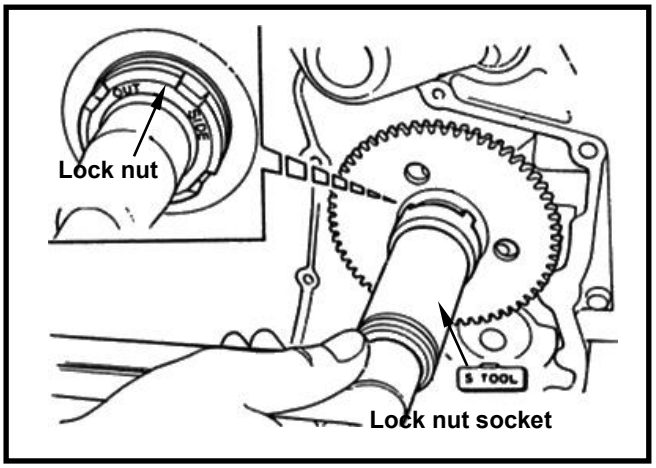


Hold the starting driven gear with the universal fixture.
Tighten the 22mm anti-loosen lock nut and gasket.

⚠ Caution

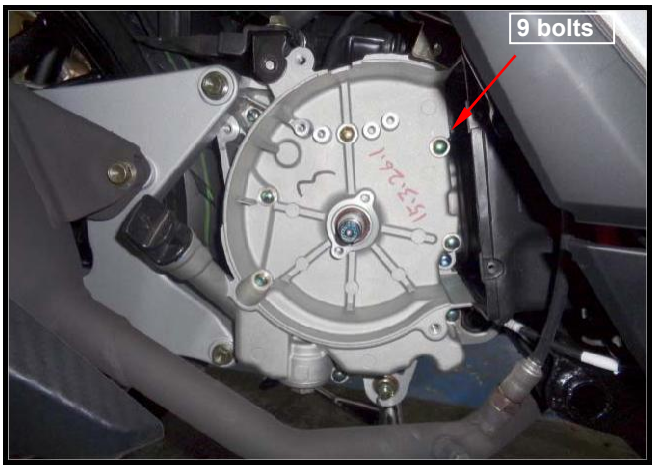
Add engine oil onto the thread of lock nut.

Special service tools:
Anti-loosen lock nut socket
Universal fixture
Torque value: 9.0~10.0kgf-m



RIGHT CRANKCASE COVER INSTALLATION

Install setting pin and new gasket on the crankcase.
Replace the right crankshaft oil seal of the crankcase and apply some oil onto the oil seal lip.
Install right crankcase cover onto the right crankcase. (9 bolts)
Torque value: 1.5~2.0kgf-m

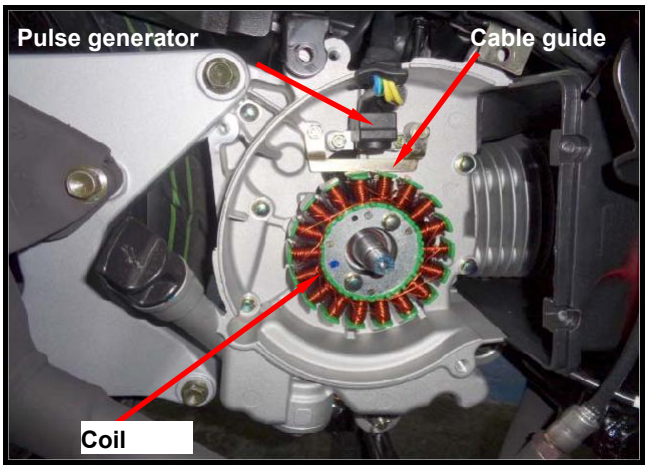


MOUNTED COIL SET INSTALLATION

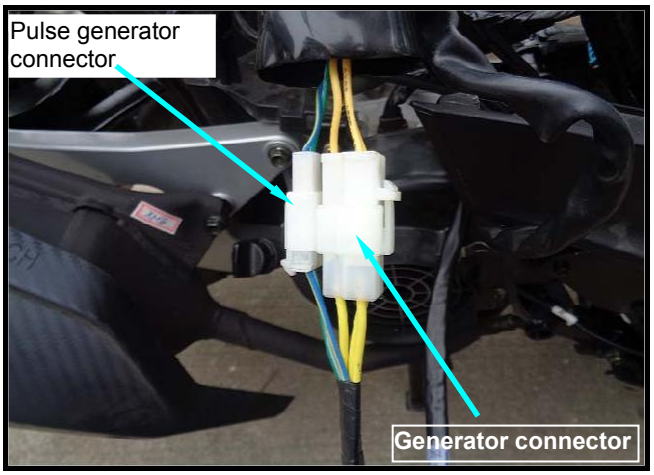
Install the coil set onto right crankcase cover. (2 screws)
Install pulse generator. (2 screws)
Tighten the cable guide. (2 screws)
Torque: 1.5~2.0kgf-m
Tie the wire harness hose onto the indent of crankcase.

⚠ Caution

Make sure that the wire harness is placed under the pulse generator.

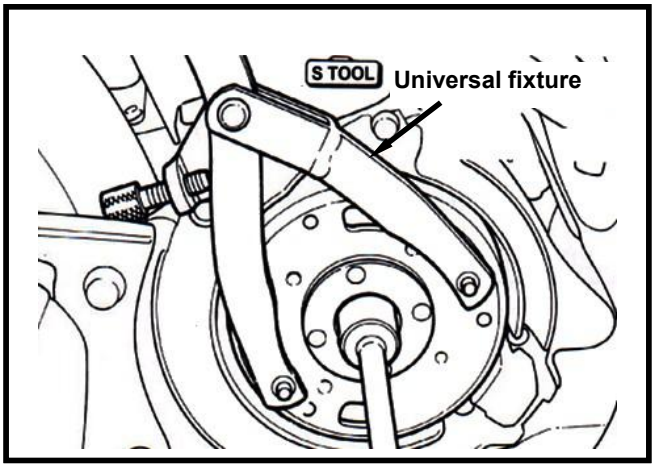


Install A.C. generator connector and pulse generator connector.

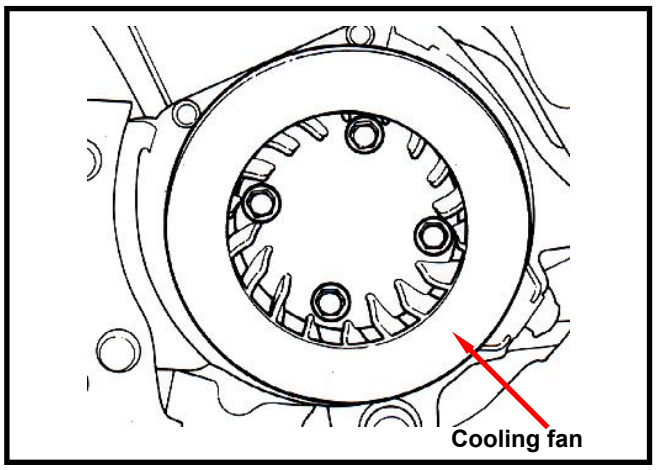


FLYWHEEL INSTALLATION

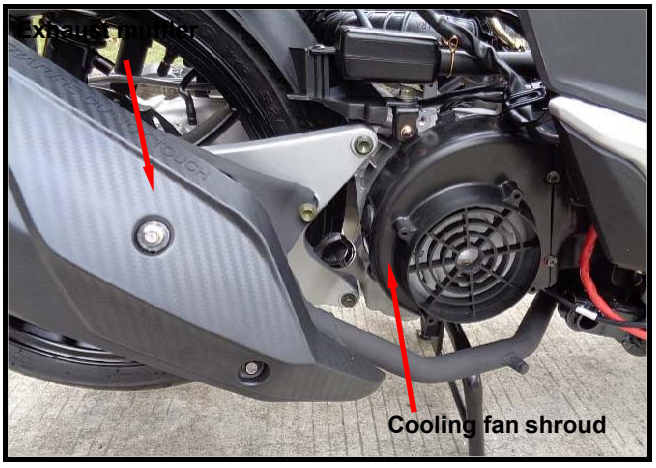
Make sure that there is no magnetic powder. If so, clean up it.
Align insert on crankshaft with the flywheel groove, and then install the flywheel.
Hold the flywheel with flywheel holder, and tighten its nut.
Torque value: 5.0~6.0kgf-m
Special service tool:
Universal fixture



Install the cooling fan. (4 bolts)
Torque value: 0.8~1.2kgf-m



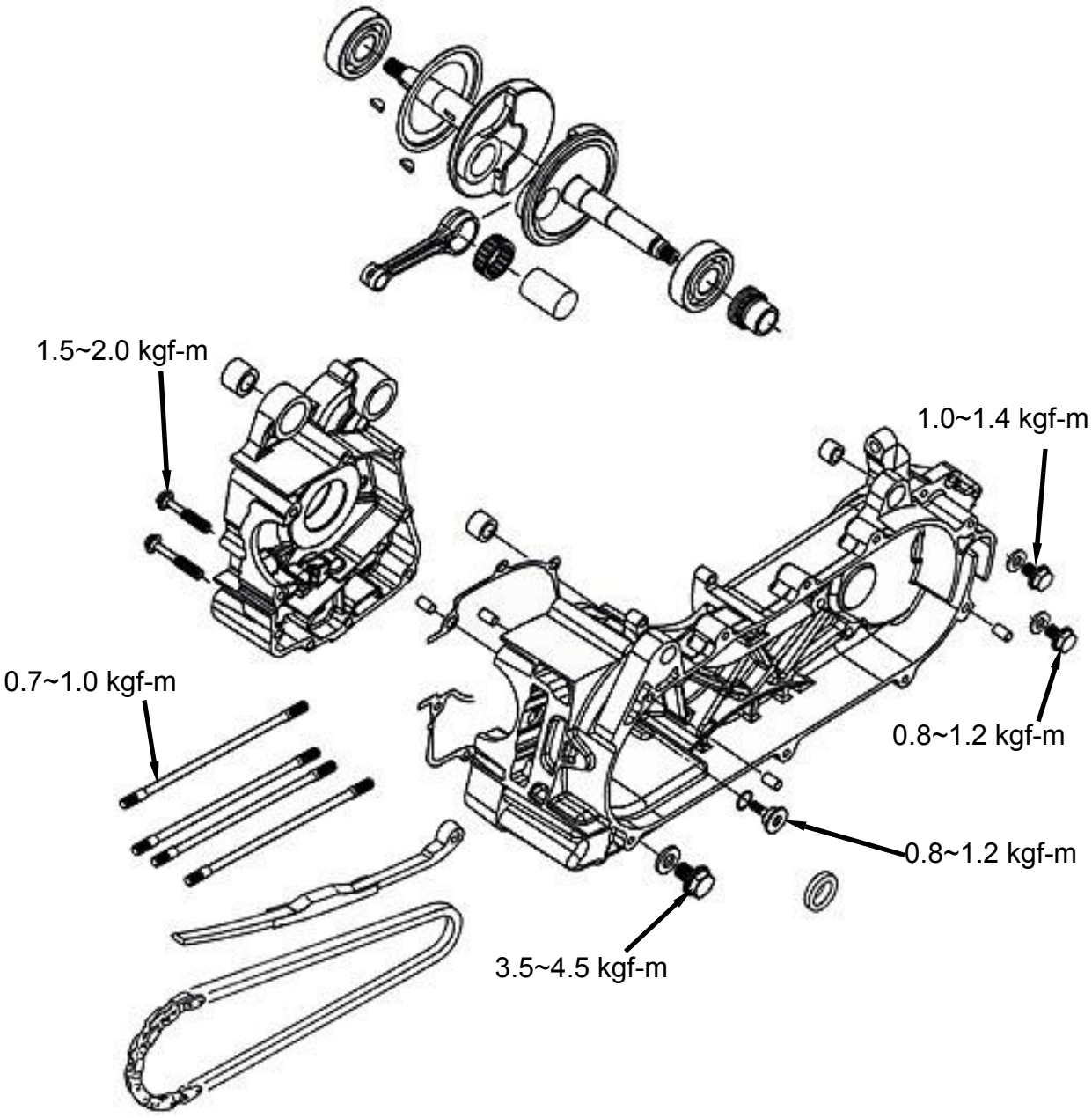
Install the cooling fan shroud. (4 bolts)
Install the exhaust muffler. (3 bolts, 2 nuts)
Install the body cover.
Add some engine oil according the specified quantity.



11. CRANKCASE/CRANKSHAFT

CONTENTS

MECHANISM DIAGRAM



11. CRANKCASE/CRANKSHAFT

OPERATIONAL PRECAUTIONS

General Information

- This Section contains descriptions concerning disassembly of the crankcase so that the crankshaft can be serviced.
- Complete following operations before disassembling crankcase.

Engine	Chapter 5
Cylinder head	Chapter 6
Cylinder and piston	Chapter 7
V-belt Drive pulley	Chapter 8
AC generator/ Starting Clutch	Chapter 10
Start motor	Chapter 16

- If the crankshaft bearing or timing sprocket need be replaced, then the crankshaft set have to replaced.

Specification Unit: mm

Item	Standard	Limit
Left, right clearance of the big end of the connecting rod	0.100~0.350	0.550
Radial clearance of the big end of the connecting rod	0.000~0.008	0.050
Run-out	Left side: Below 0.035 Right side: Below 0.035	Left side: 0.035 Right side: 0.030

Torque value

Bolts for crankcase	1.5~2.0 kgf-m
Bolts for cylinder/cylinder head	0.7~1.0 kgf-m
Engine oil draining plug	3.5~4.5 kgf-m
Bolts for cam chain tensioner	0.8~1.2 kgf-m

Special Service Tools

Crankcase remover/set
Crankshaft installation puller
Inner type bearing puller
Outer type bearing puller
Bearing pressing tools
Oil seal pressing tools

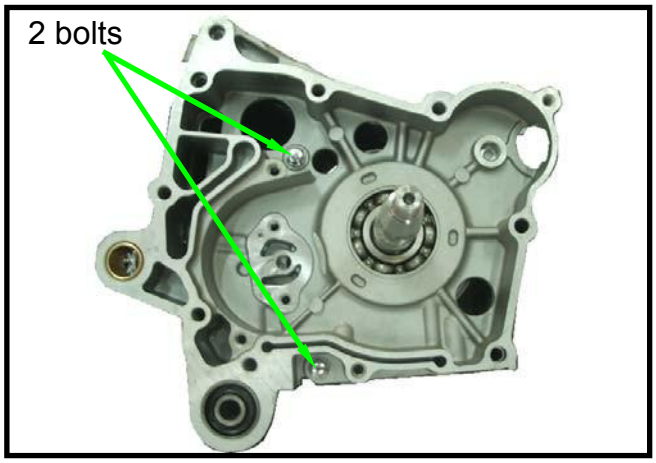
TROUBLE DIAGNOSIS

Engine noise

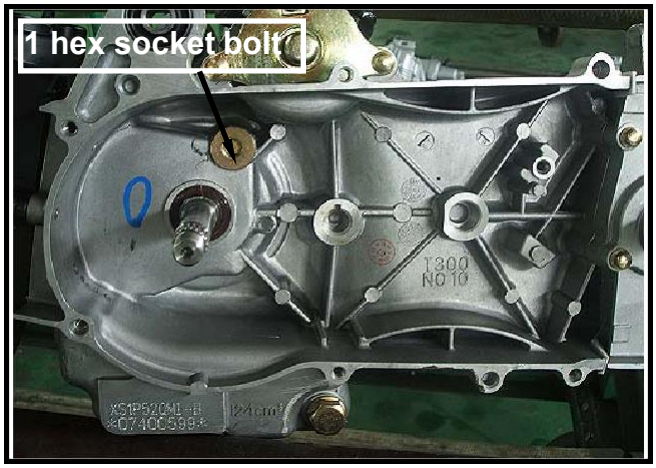
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Wear piston pin or piston pin hole

DISASSEMBLY OF CRANKCASE

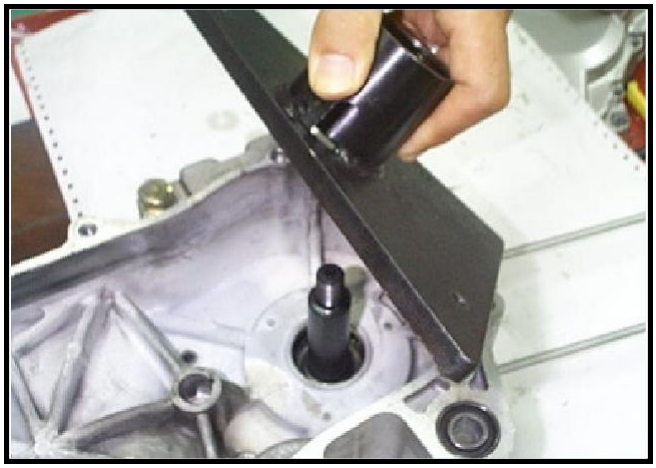
Remove the 2 bolts from the right crankcase.



Remove the cam chain tensioner (hex socket bolt) from the left side of crankcase.



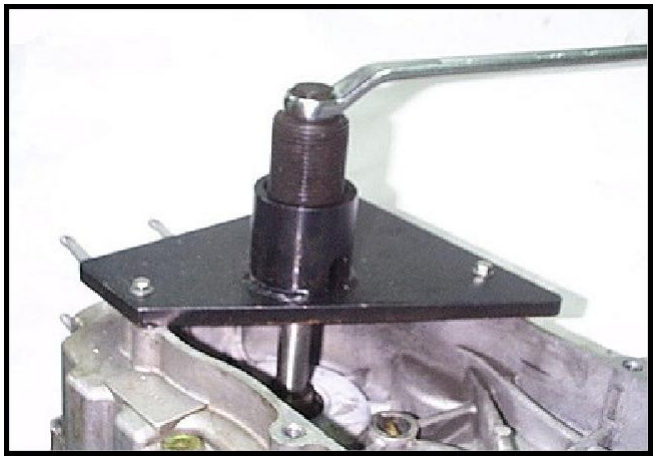
Place the left side of crankcase upward, and then install the crankcase remover/set onto the crankcase.
Drive the screw of the crankcase remover/set into the crankcase, and then separate the left and the right crankcases.
Remove the cam chain.



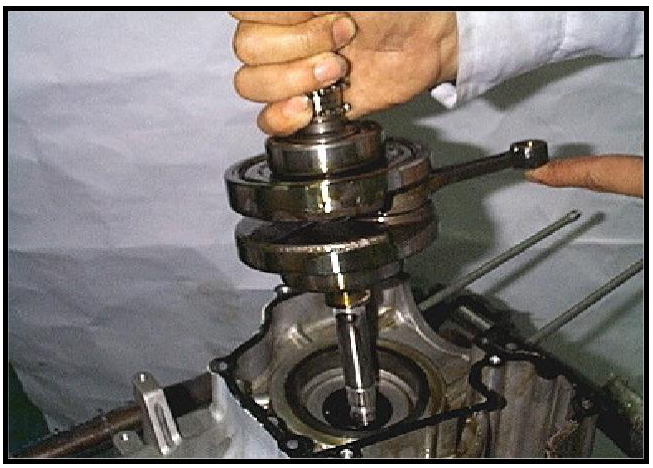
⚠ Caution

- Never pry out the connection surfaces of crankcases as separating. Otherwise, the connection surfaces could be damaged and cause oil leaking.
- It have to separate the cam chain and the drive gear before pressing out the both left and right crankcases.

Special Service Tools:
Crankcase remover/set



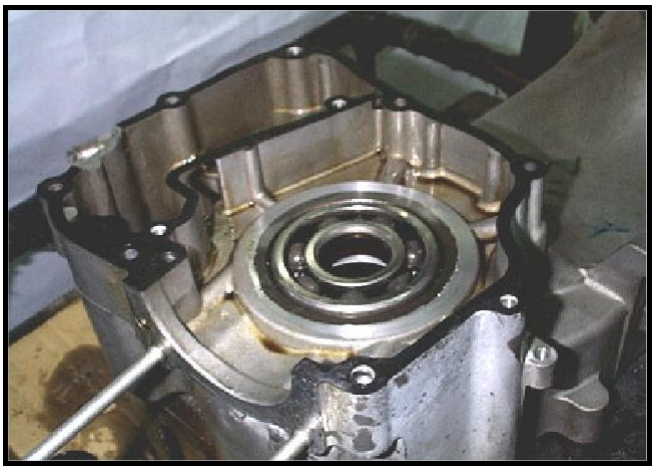
Remove the crankshaft from the right crankcase.



⚠ Caution

- The left and right bearings of crankshaft is to press-fit onto the crankshaft.

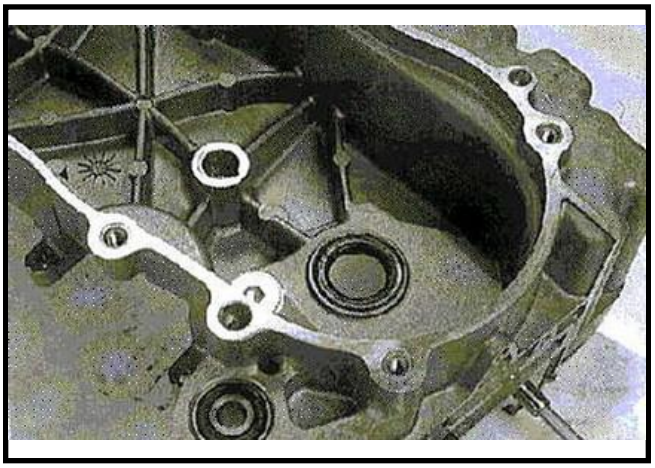
Remove gasket and dowel pins (2).
Scrape gasket residues off the crankcase contact surface.



⚠ Caution

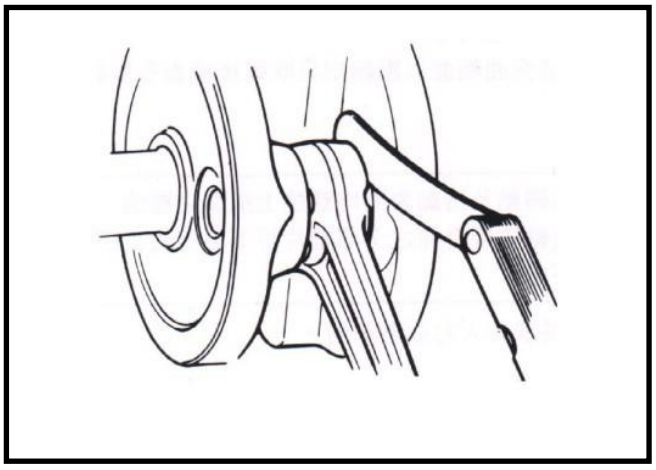
- Do not damage contact surface of the crankcase.
- Soap the gasket residues into solvent and the residues will be removed easily.

Remove oil seal from the left crankcase.

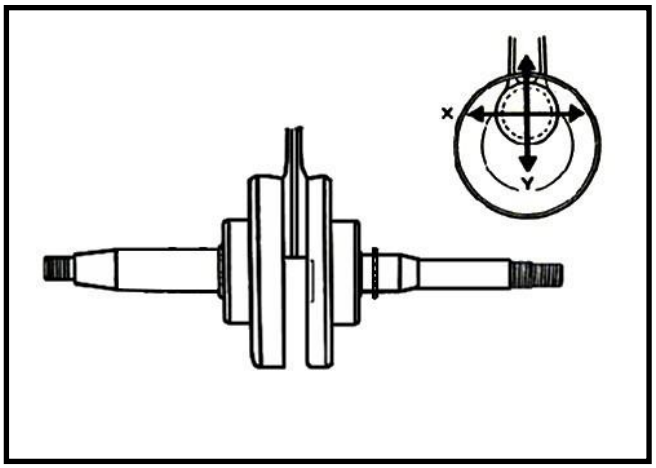


CRANKSHAFT INSPECTION

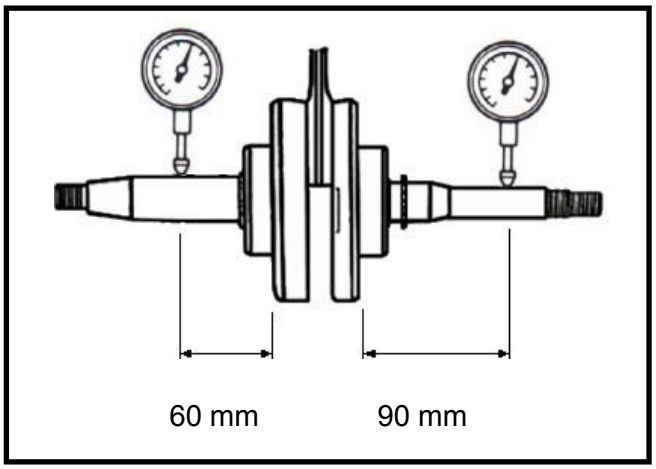
Measure left and right clearance of connecting rod big end.
Service limit: Replace when it is more than 0.55 mm



Measure the radical clearance of the big end at the vertical directions.
Service limit : 0.05 mm

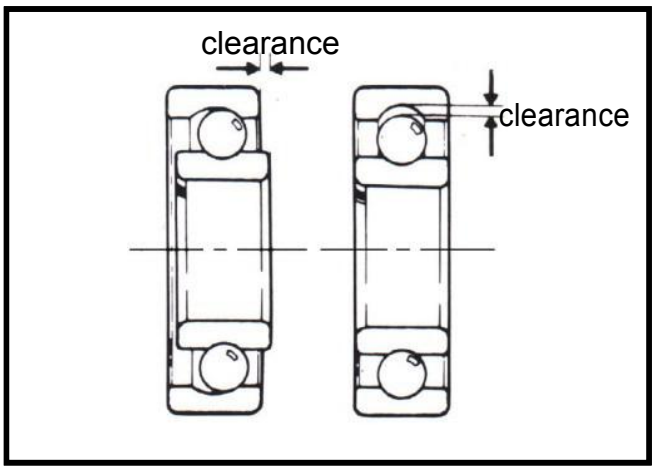


Place the crankshaft onto a V-block and measure run-out of the crankshaft with dial gauge.
Service limit: Left side: 0.035mm
Right side: 0.030mm



Bearing Inspection

Rotate the bearing with fingers and make sure the bearing can be rotated smoothly and quietly.
Check if the inner ring is connected onto the crankshaft tightly.
Replace crankshaft as a set when noise or looseness is detected.

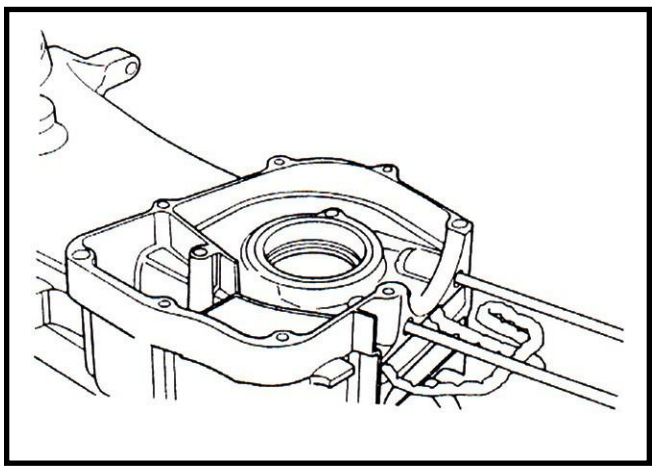


ASSEMBLY OF CRANKCASE

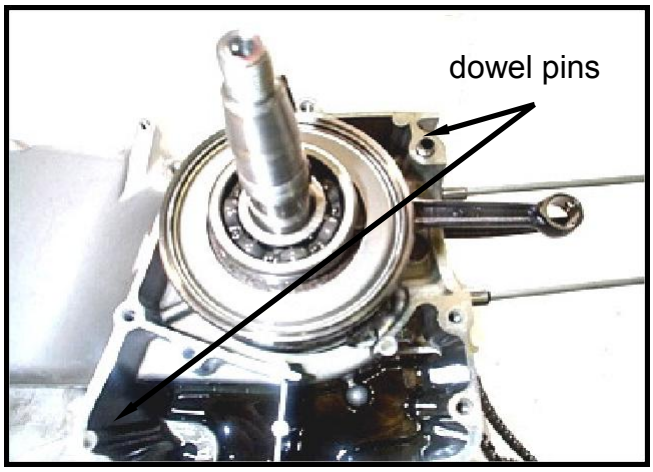
Install cam chain into the chain hole of the left crankcase, and then split out the cam chain.

⚠ Caution

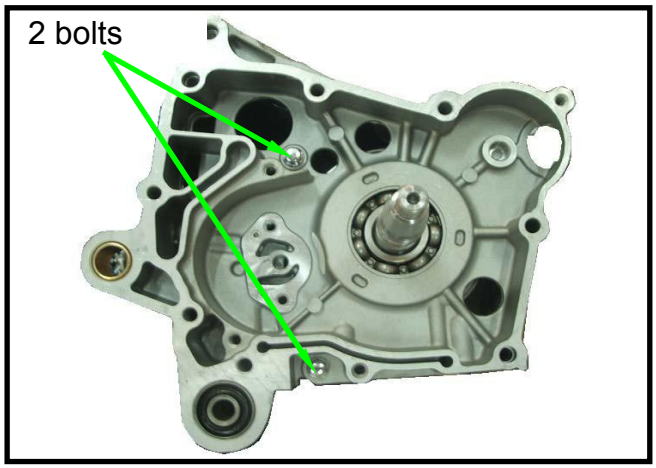
- Do not damage the cam chain as installing the crankshaft.



Install crankshaft into the left crankcase and then install two dowel pins and new crankcase gasket.



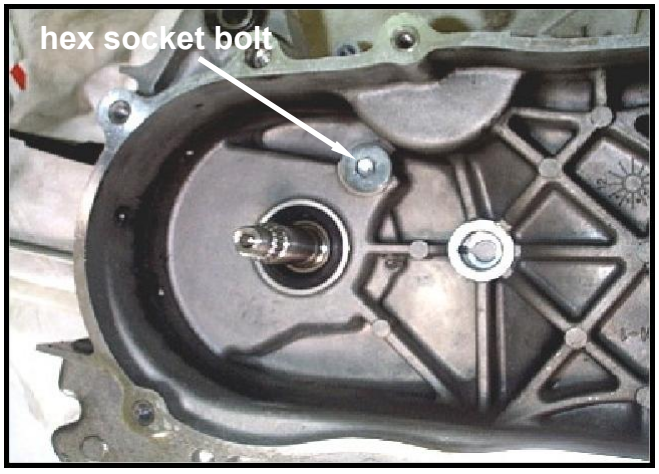
Install the right crankcase and tighten the crankcase bolts (2 bolts).
Torque value: 1.5~2.0 kgf-m



Install the cam chain tensioner.
Install a new O-ring onto the mounting bolt of the chain tensioner.
Apply some oil on the O-ring and tighten the bolt.
Torque value: 0.8~1.2 kgf-m

⚠ Caution

- The O-ring must be installed into the bolt's groove.

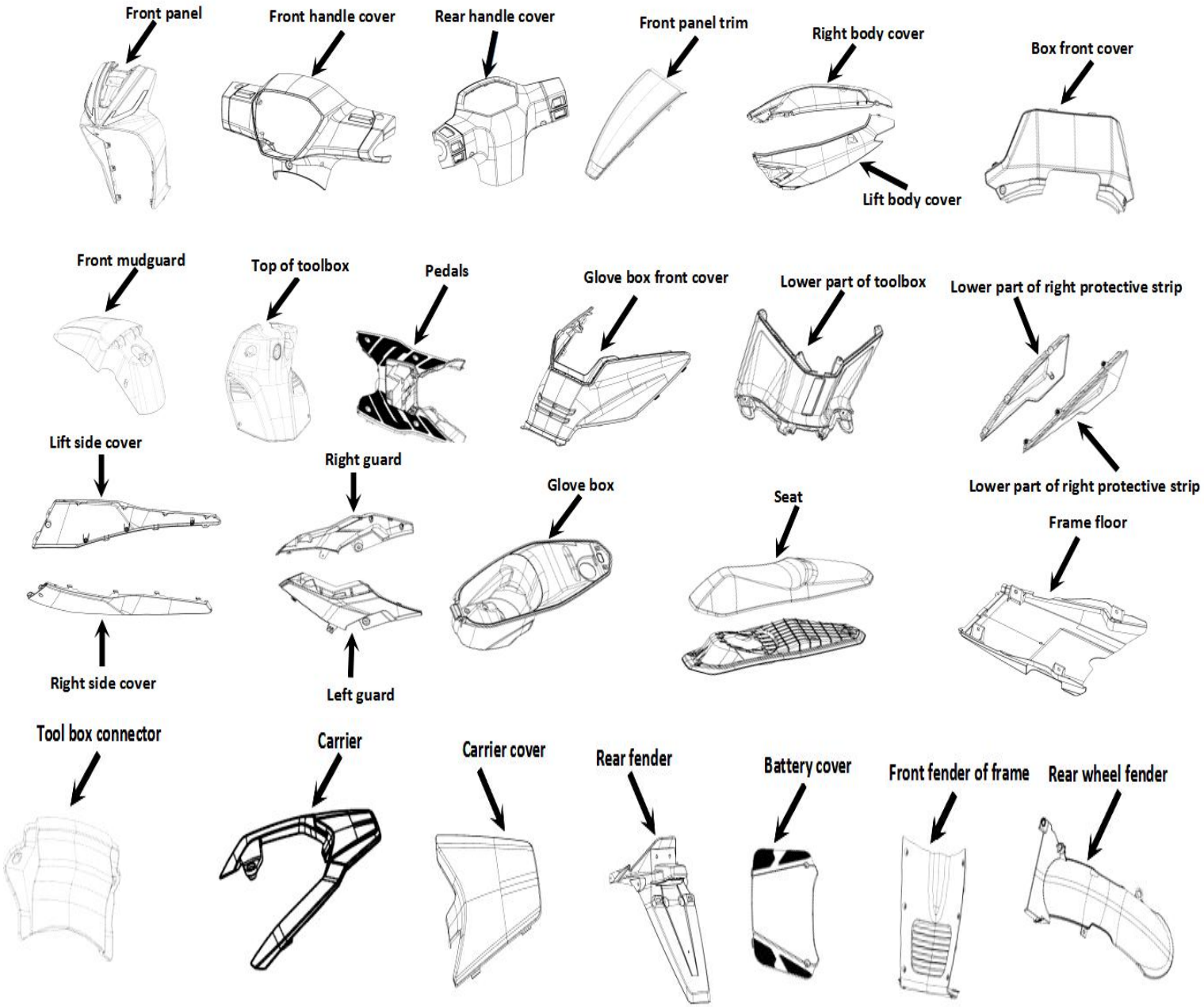


Apply with some grease onto the oil seal lip and then install it onto the left crankcase.

Press-fit the oil seal to specified position with the oil seal installer (19.8x30x5).
Special service tools: the oil seal installer (19.8x30x5)

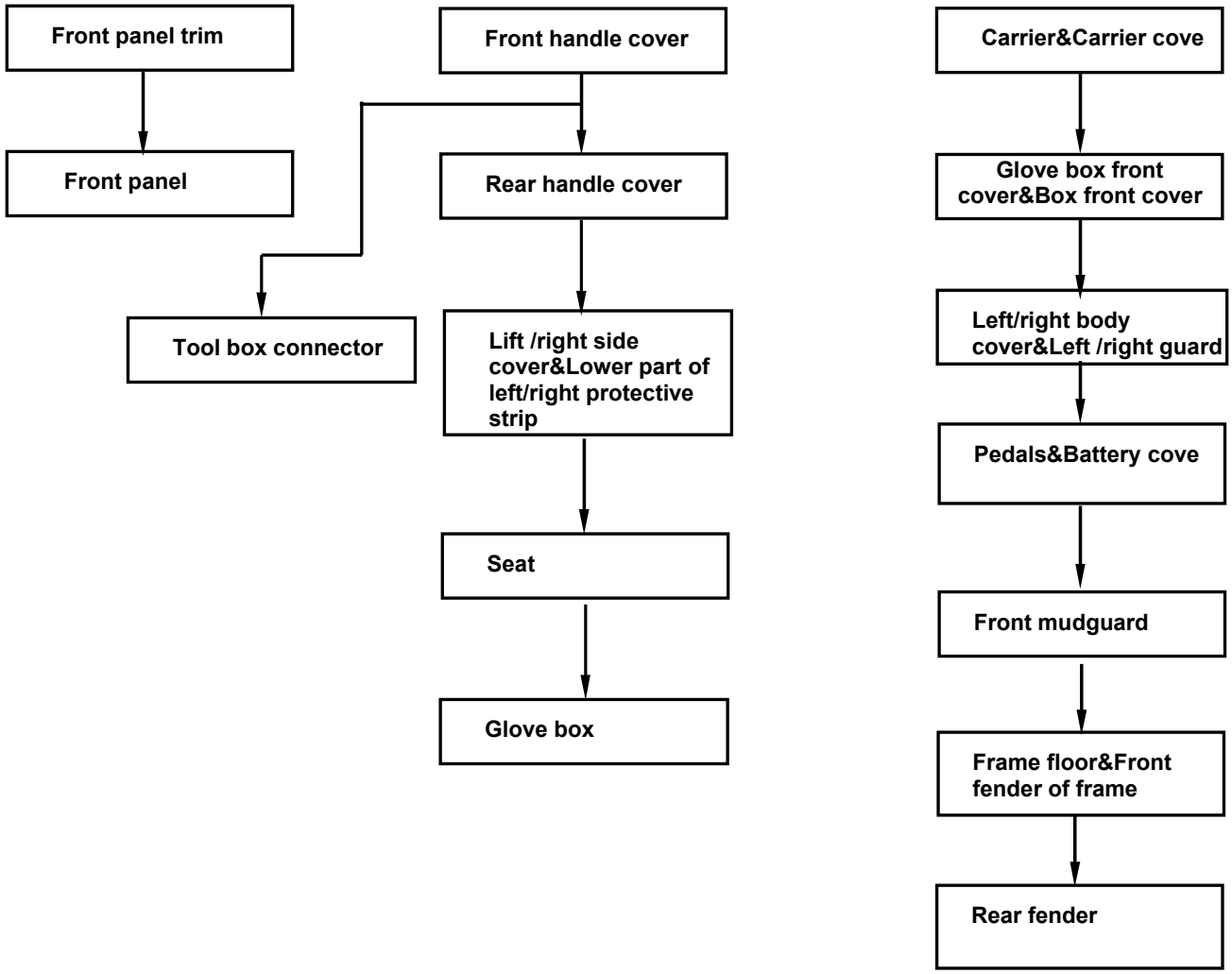
12. BODY COVER

CONTENTS


Front panel
Front handle cover
Rear handle cover
Front panel trim
Right body cover
Box front cover
Lift body cover
Front mudguard
Top of toolbox
Pedals
Glove box front cover
Lower part of toolbox
Lower part of right protective strip
Lift side cover
Right guard
Glove box
Seat
Frame floor
Lower part of right protective strip
Right side cover
Left guard
Tool box connector
Carrier
Carrier cover
Rear fender
Battery cover
Front fender of frame
Rear wheel fender

MAINTENANCE INFORMATION

Body covers disassemble sequence:



- Be careful not to damage various covers in disassembly or re-assembly operation.
- Never injure hooks molded on the body covers in disassembly or re-assembly operation.
- Align the buckles on the guards with slot on the covers.
- Make sure that each hook is properly installed during the assembly.
- Never compact forcefully or hammer the guard and the covers during assembly.

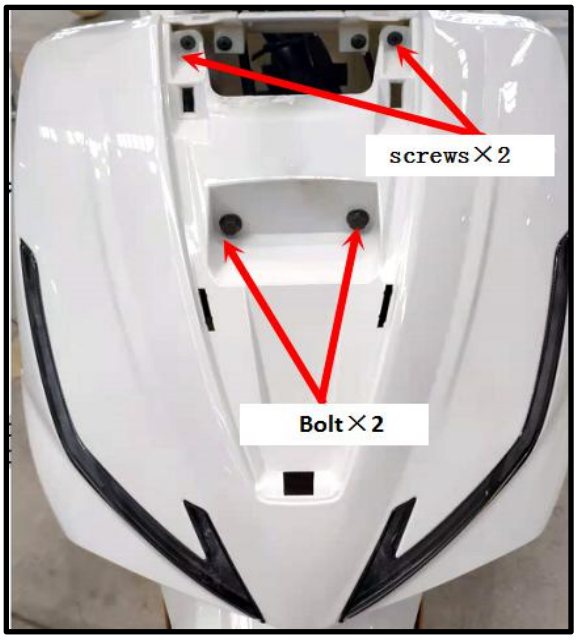
FRONT PANEL

Removal:

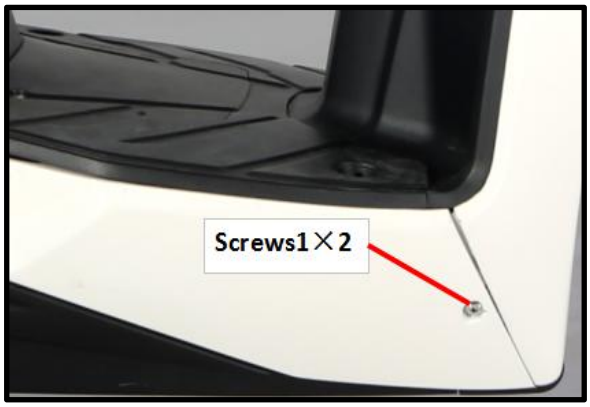
Remove the Front panel trim.

No need to remove screw fixing, buckle type installation）

Remove the mounting screws and bolt. (2 screws、2bolt) .



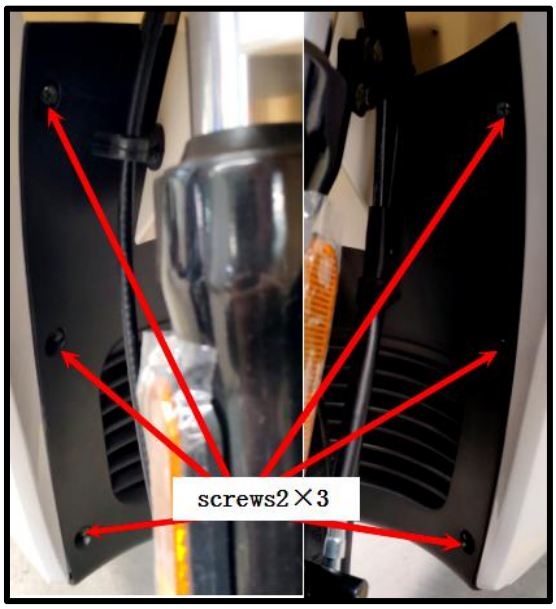
Remove the mounting screws and bolt.(2 screw)



12. BODY COVER

Remove the mounting screws and bolt.(4 screw)

Remove the front under cover 6 mounting screws
Between the front under cover and the frame .



Installation:
Install according to the reverse procedure of removal.

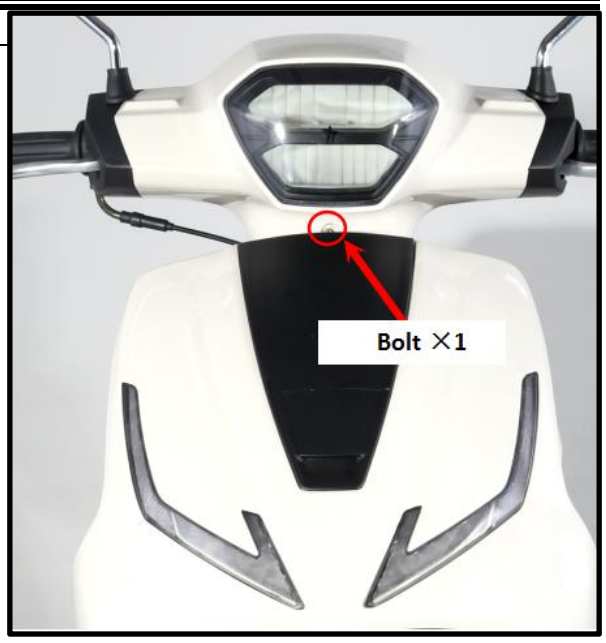
⚠ **Caution**

With the clipper to fix the end-section of the handlebar cover. Do not pull it forcedly to avoid to breaking the hooks.

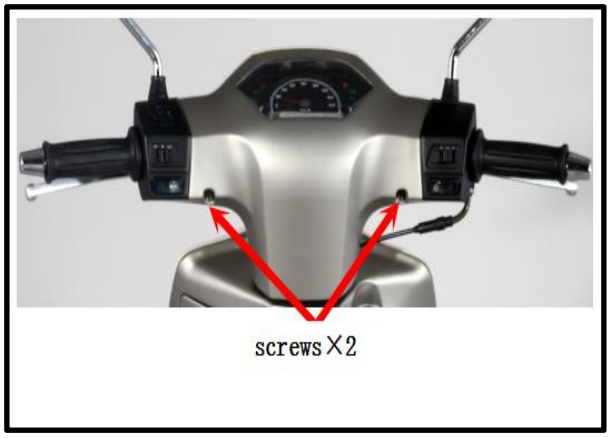
HANDLE COVER

Removal

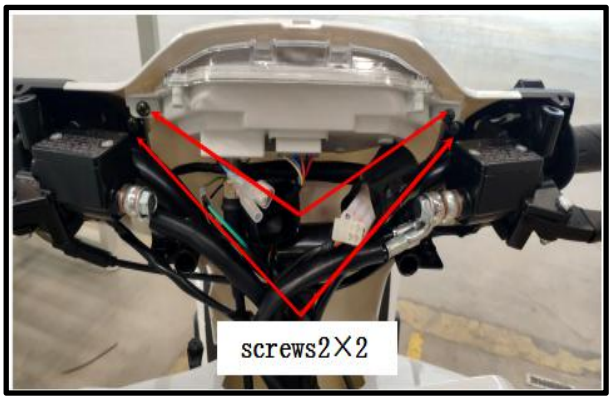
Remove 1 lower mounting bolt of the handle front cover.



Remove the mounting screws (2 screws) between the front handle cover and the rear handle cover.



Remove the front handle cover. Remove the speedometer cable.
Remove the rear handlebar cover. (4 screws)
Removed the rear handle cover.



Installation:

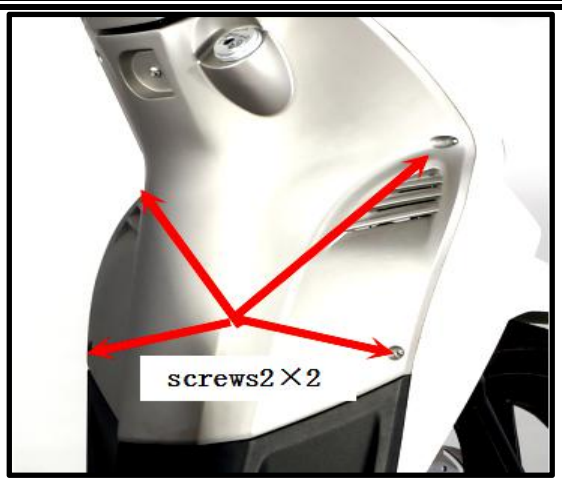
Install according to the reverse procedure of removal.

⚠Caution

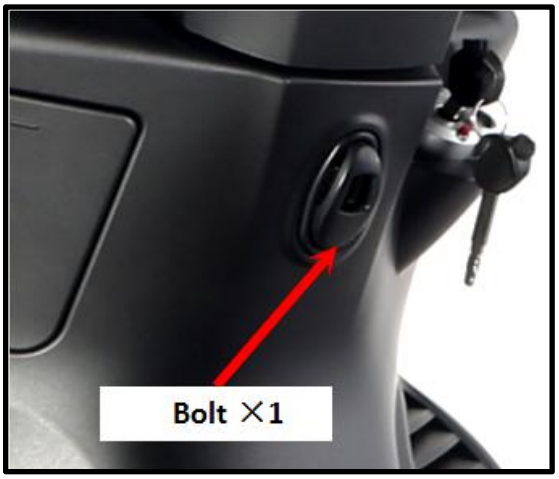
With the clipper to fix the end-section of the handlebar cover. Do not pull it forcedly to avoid to breaking the hooks.

TOP OF TOO BOX

Remove the 4 mounting screws between the front cover and the front inner box.

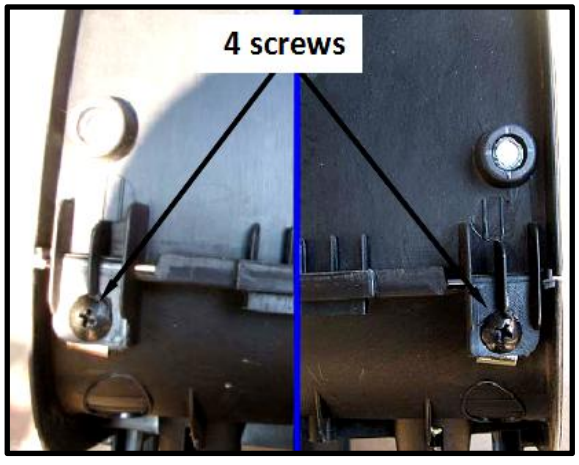


Remove the hook screw bolt from theTop of toolbox .



Remove the main switch cover.

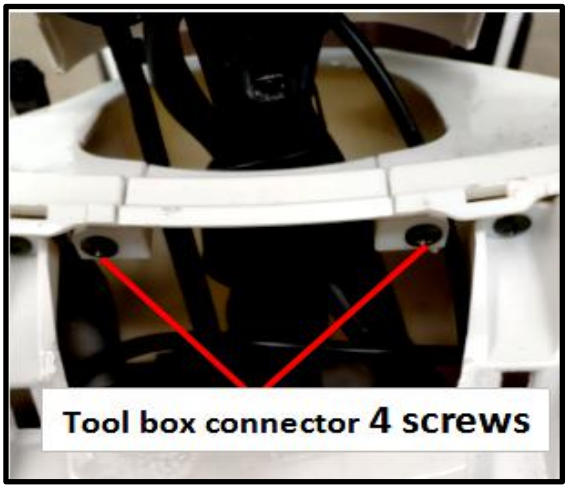
Remove the front cover and front under cover.
Remove the 4 mounting screws between the floor panel and the front inner box.



Installation

Install the top of too box according to the reverse procedure of removal.

Remove the Tool box connector.



Installation

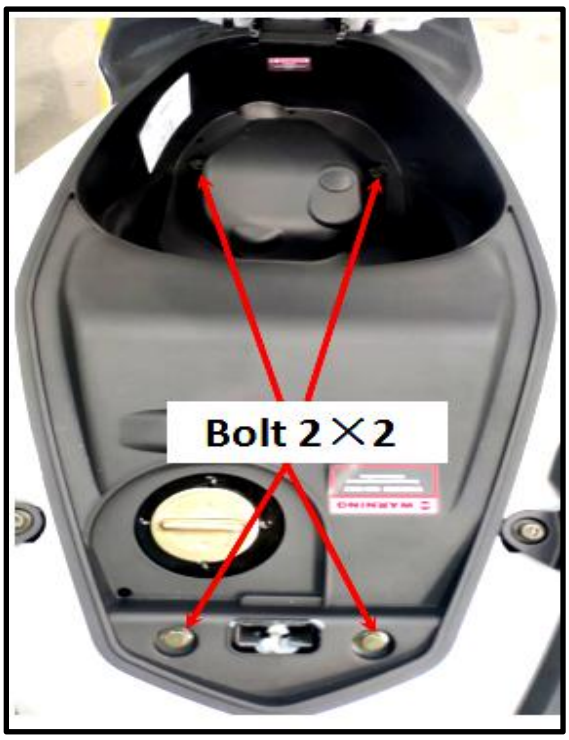
Install the inner box A and the front inner box B accordingto the reverse procedure of removal.

BODY COVER/REAR CARRIER /GLOVE BOX/REAR FENDER

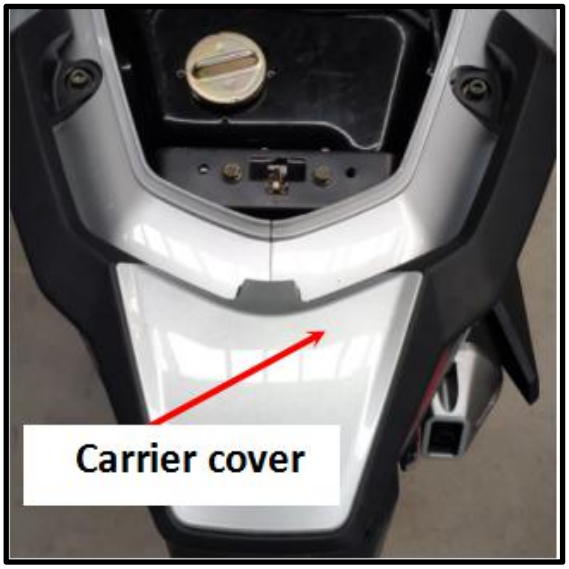
Removal

Open the seat.

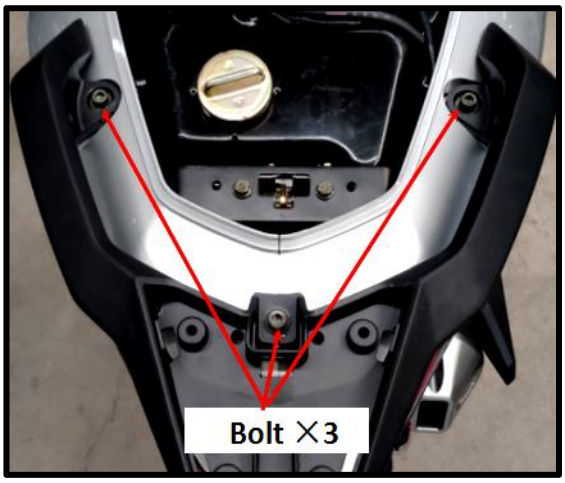
Remove 4 bolts in front of the Glove box.



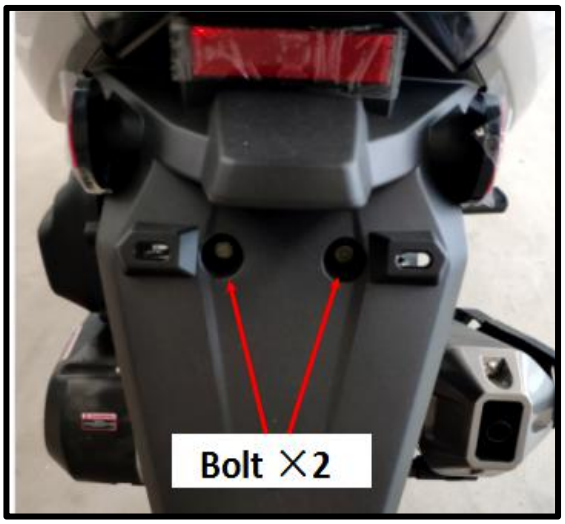
Remove the Carrier cover.



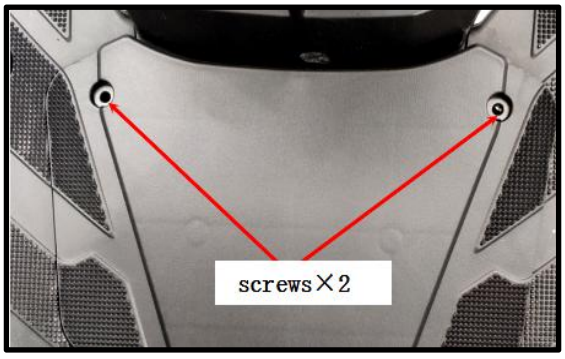
Remove 3 bolts the Rear Carrier .



Remove the 2 mounting bolts of the rear fender.

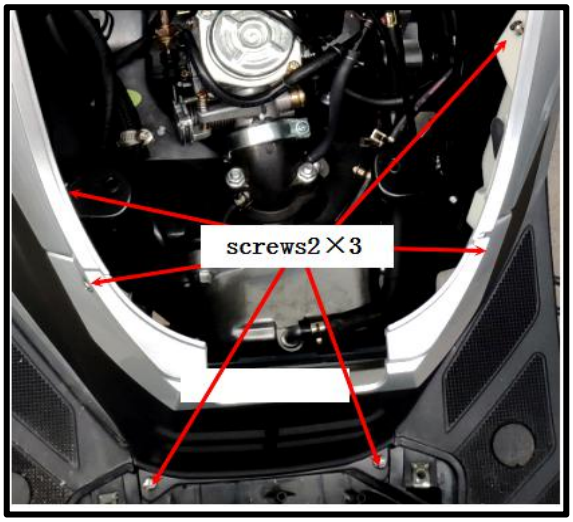


Remove the 2 mounting screws the Battery cover.



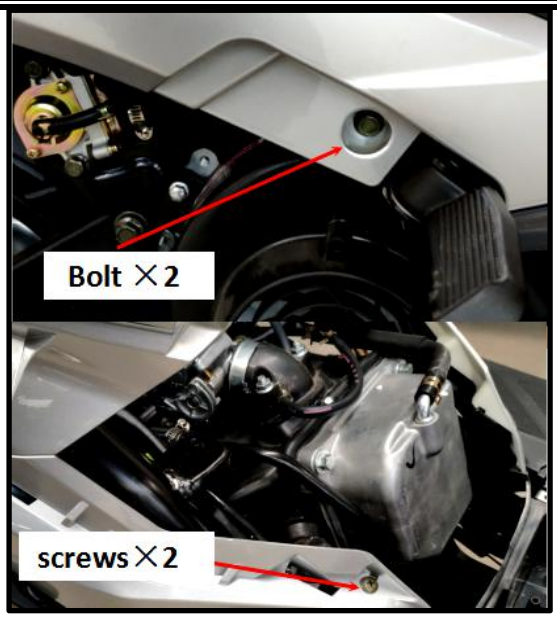
Remove the 6 mounting screws the Box front cover and glove box front cover.

.



Remove the left/right side 2 mounting bolts front of the body cover between the body cover and the frame.

Remove the left/right side 2 mounting screws front of the body cover between the body cover .



Remove the rear carrier.
Remove the glove box.
Remove the rear fender.
Remove the left/right body cover

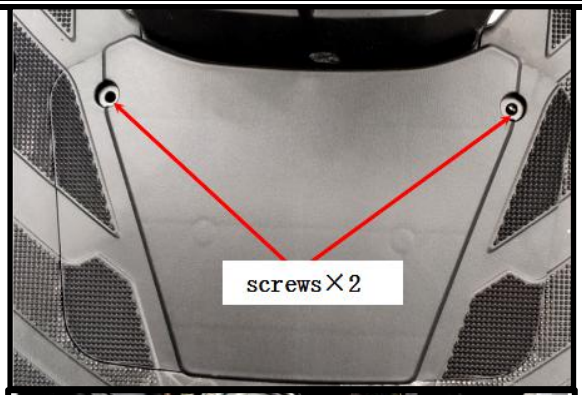
Installation

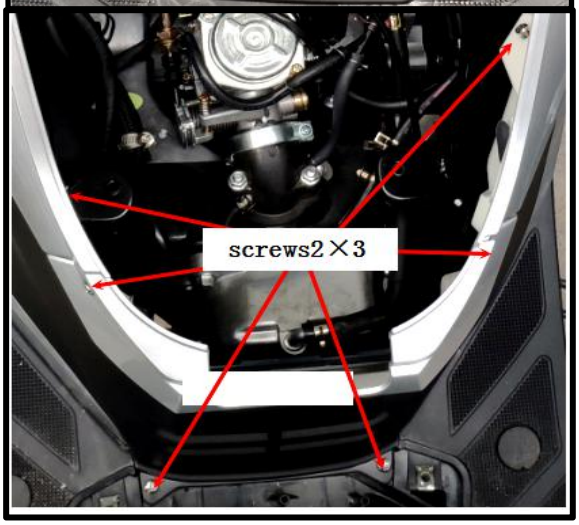
Install the body cover and rear carrier and glove box according to the reverse procedure of removal.

GLVE BOX FRONT COVER

Removal
Remove the 8 screws .
Remove the glove box front cover.

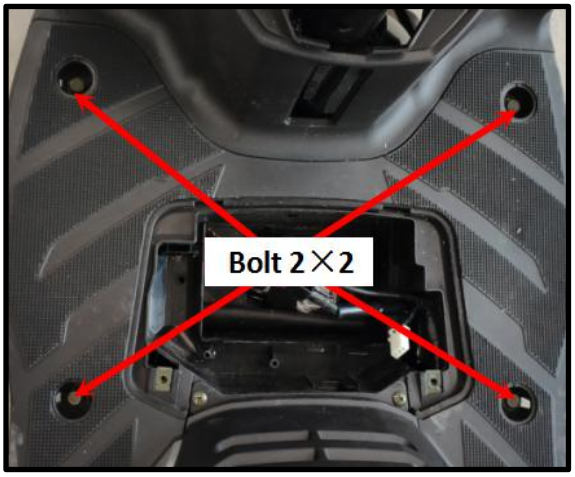
Installation
Install the front center cover according to the reverse procedure of removal.





FLOOR PEDALS

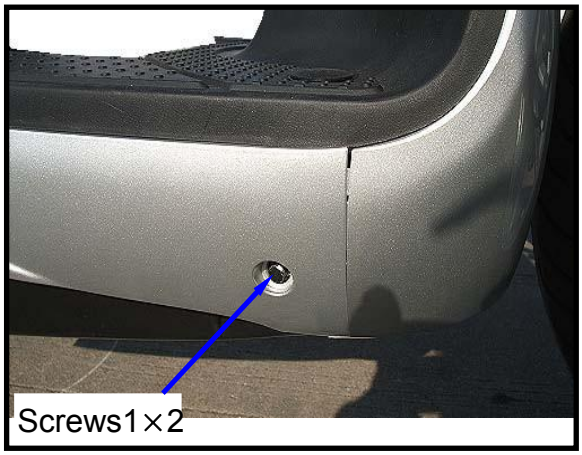
Removal
Remove the 4 bolts from the luggage box.
Remove the front center cover



LIFT/RIGHT SIDE COVER

Removal
Remove the left/right side 2 mounting screws in the front of the side cover.

Remove the left/right side cover.
Installation
Install the side cover according to the reverse procedure of removal.



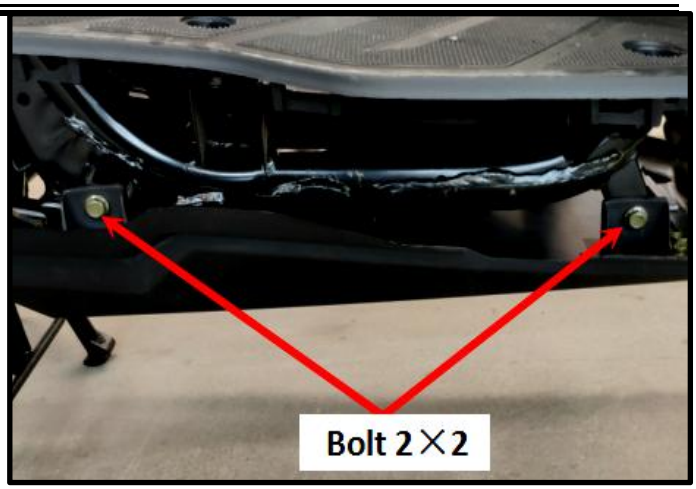
FRAME FLOOR

Removal

Remove the floor panel. Remove the left/right side cover.

Remove the left/right side 4 mounting bolts between the under cover and frame.

Remove the under cover.



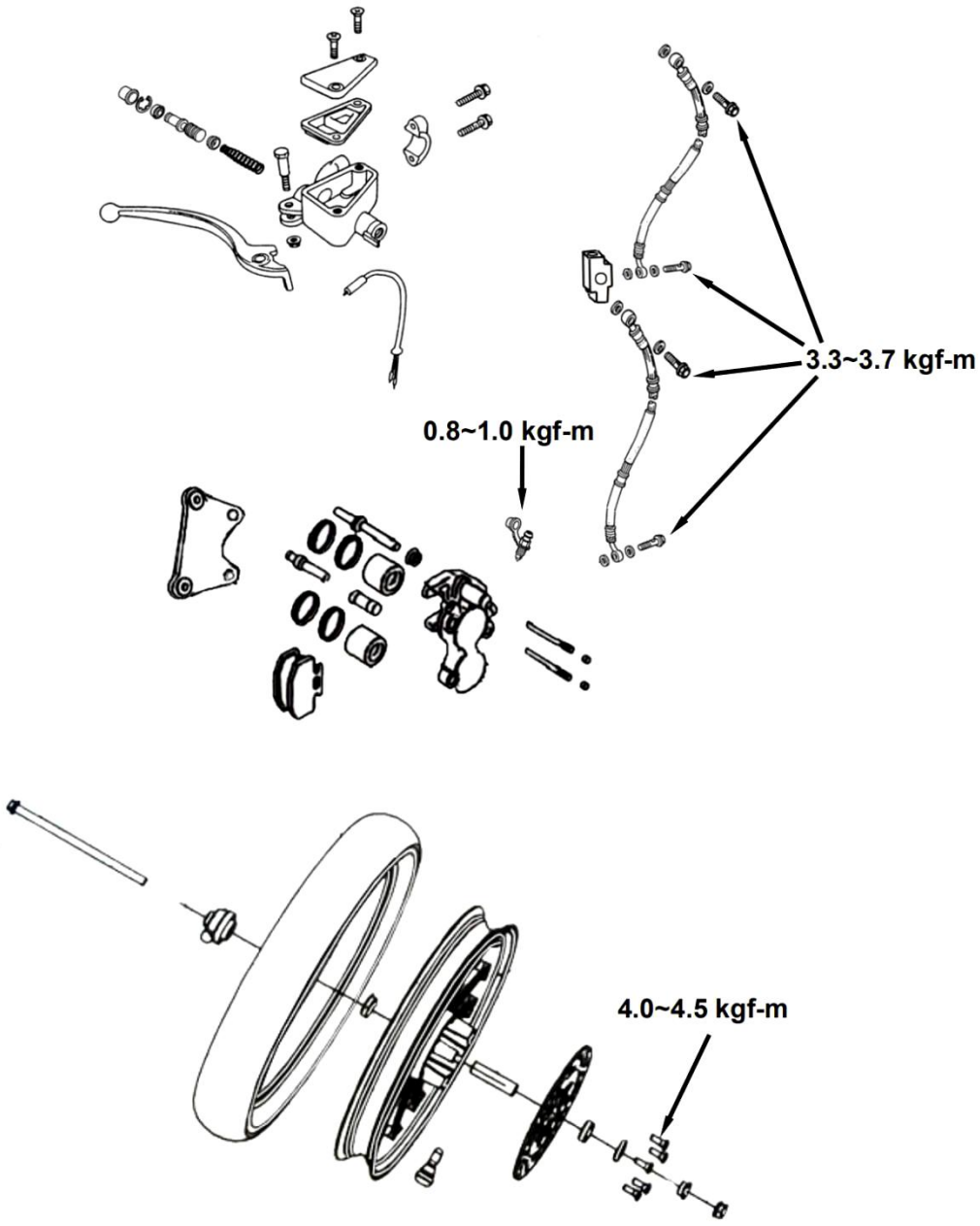
Installation

Install the under cover according to the reverse procedure of removal.

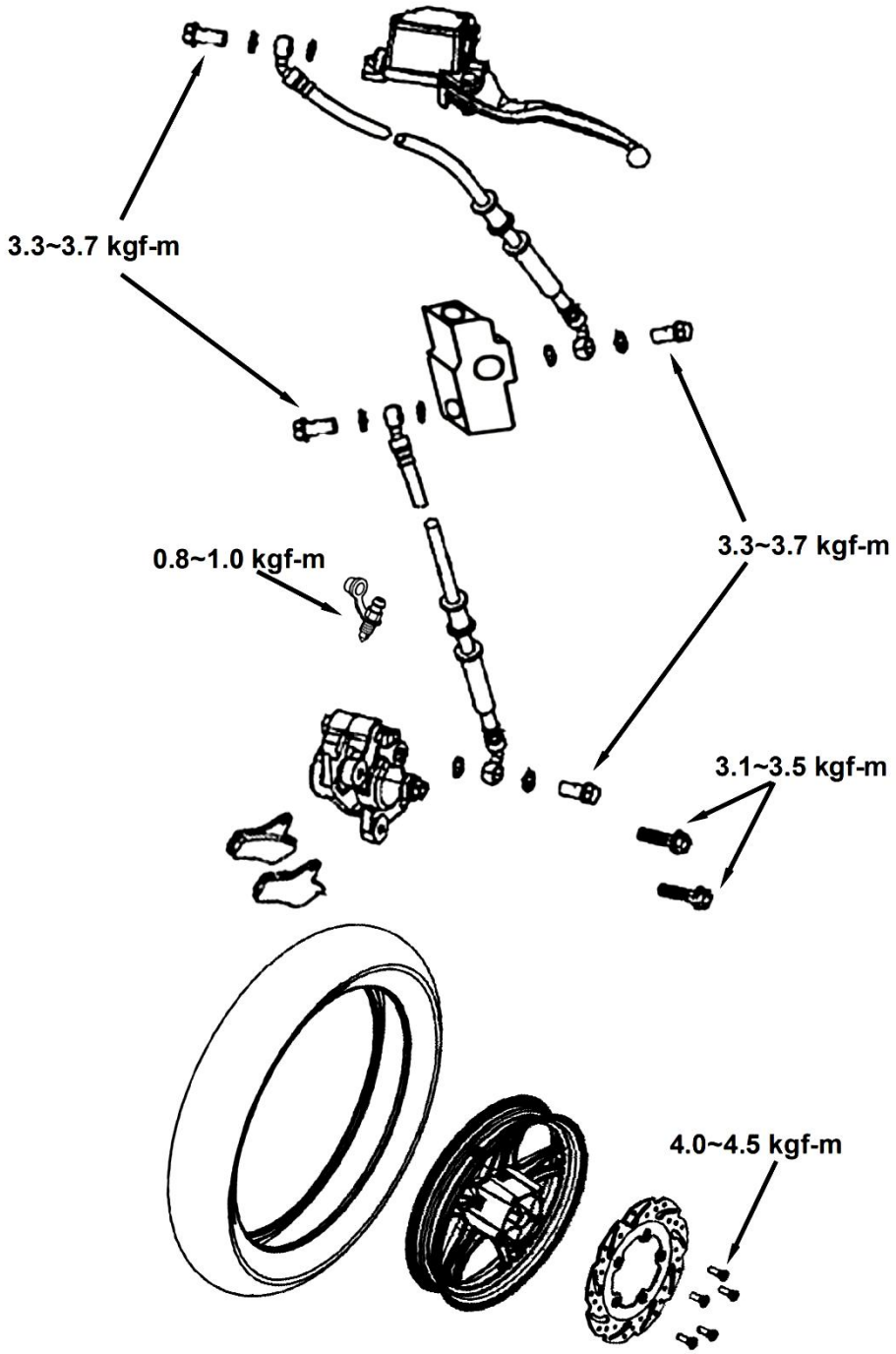
13. BRAKE

CONTENTS

MECHANISM DIAGRAM
Front Disc Brake System



MECHANISM DIAGRAM
Rear Disc Brake System



MAINTENANCE INFORMATION

Precautions in Operation

⚠ Caution

Installing lining dusts may cause disorders of respiration system or cancer, therefore, never use air hose or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.

- The brake caliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let the foreign material entering into the brake system.
- Do not spill brake fluid on the painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before you go.

Specifications **Unit: mm**

Item	Standard	Limit
The thickness of front brake disc	**3.50**	**2.00**
The thickness of rear brake disc	**3.50**	**2.00**
Front brake disc eccentricity	**0.15**	**0.30**
Rear brake disc eccentricity	**0.15**	**0.30**
Master cylinder inner diameter	**25.40**	—
OD of front brake disc	**260.00**	—
OD of rear brake disc	**240.00**	—
Thickness of front disc brake lining	—	As brake ling mark
Thickness of rear brake lining	—	2mm or As brake ling mark

Torque values

Bolt for front brake lever	0.8~1.2kgf-m
Bolt for rear brake lever	0.8~1.2kgf-m
Brake hose bolt	3.3~3.7kgf-m
Bolt for brake caliper	3.1~3.5kgf-m
Air-bleed valve	0.8~1.0kgf-m

TROUBLE DIOGNOSIS
DISC BRAKE

Soft brake lever
- Air inside the hydraulic system
- Hydraulic system leaking
- Worn master piston
- Worn brake pad
- Poor brake caliper
- Worn brake lining/disc
- Low brake fluid
- Blocked brake pipe
- Warp/bent brake disc
- Bent brake lever

Hard operation of brake lever
- Blocked brake system
- Poor brake caliper
- Blocked brake pipe
- Seized/worn master cylinder piston
- Bent brake lever

Uneven brake
- Dirty brake lining/disc
- Poor wheel alignment
- Clogged brake hose
- Deformed or warped brake disc
- Restricted brake hose and fittings

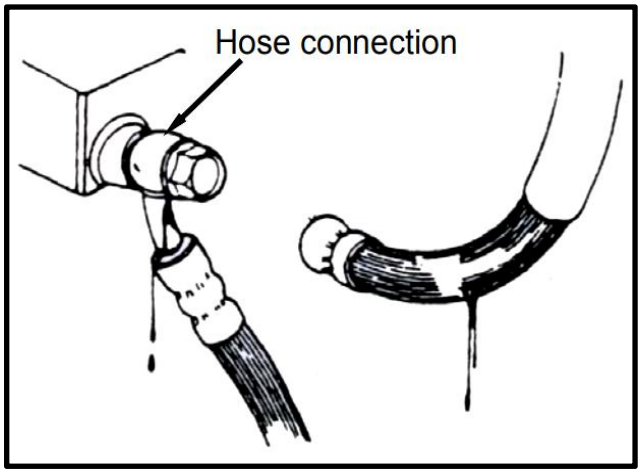
Tight brake
- Dirty brake lining/disc
- Poor wheel alignment
- Deformed or warped brake disc

Brake noise
- Dirty lining
- Deformed brake disc
- Poor brake caliper installation
- Imbalance brake disc or wheel

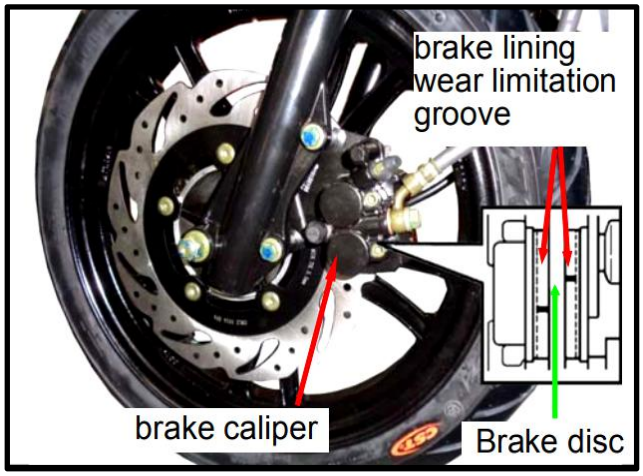
HYDRAULIC BRAKE SYSTEM INSPECTION

Inspection

Visual inspect for brake fluid leaking or damage. Check if brake hose connection loosen with wrench and turn the handlebar from right to left motion or press down the shock absorber to check if there is something is interfered with the brake system or brake components.



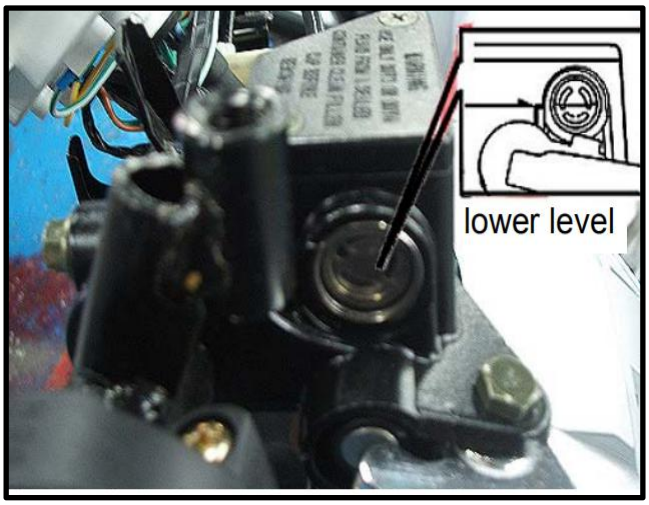
Operate the brake system and check the brake lining. Check the front brake from front side, and replace the brake lining with new one when the brake lining wear limitation groove reaches to the brake disc.



Park the motorcycle on a flat ground and check its brake fluid level.
Recommended brake fluid: WELLRUN DOT 3 brake fluid

⚠ CAUTION

- The fluid level will not be correct if parking the motorcycle in title or just parking. It has to waiting for around 3~5 minutes.
- Never use faked brake fluid to prevent from chemical reaction.
- It has to apply with same brand brake fluid to sure the brake performance.

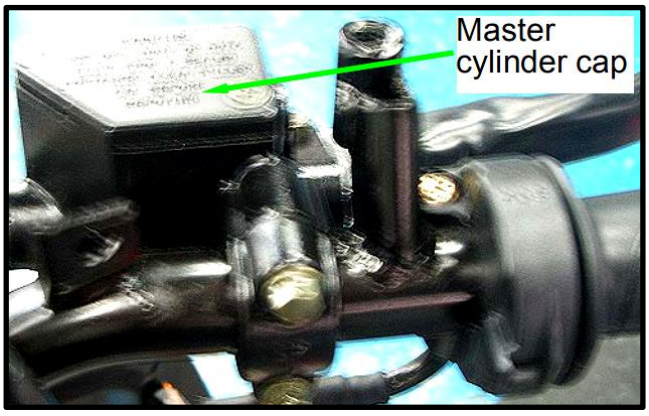


Brake Fluid Add

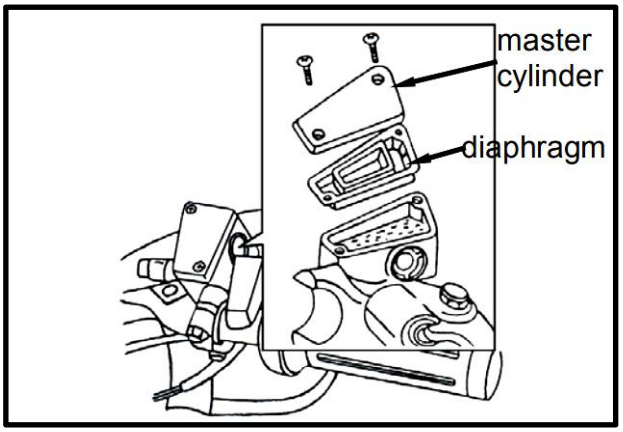
Turn the handlebar to let the master cylinder in horizontal position before removed the master cylinder cap.
Place a rag onto painting, plastic or rubber components when conduct brake system maintenance.

⚠ CAUTION

- Do not over the upper level when adding brake fluid and avoid to spilling brake fluid on painted surfaces, plastic or rubber components to result in their damages.



Remove the master cylinder cap and diaphragm.
Add good quality brake fluid and it has to add same brand brake fluid into the master cylinder.
Clean dirty brake disc.

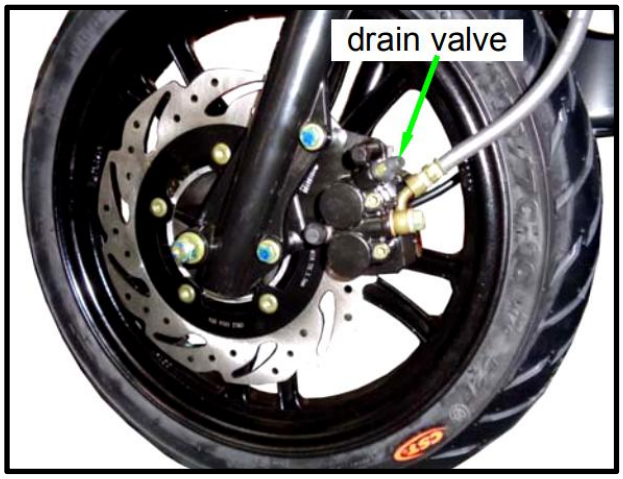


⚠ CAUTION

The dirty brake lining or disc will reduce the brake performance. The mixed non-compatible brake fluid will reduce brake performance. Foreign materials will block the system causing brake performance to be reduced or totally lost.

BRAKE FLUID REPLACEMENT/ AIR-BLEED

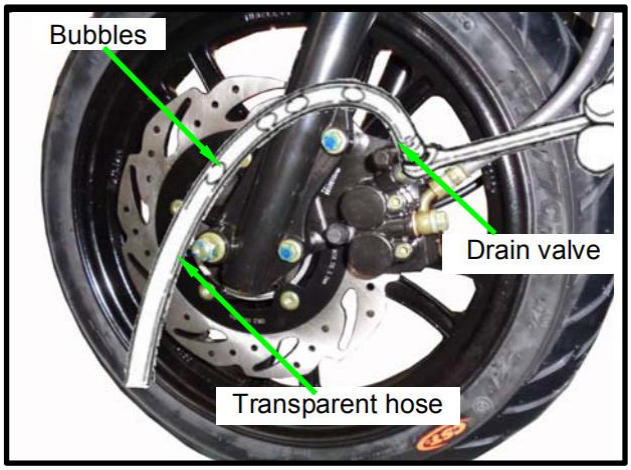
Connect drain hose to drain valve.
Open the drain valve on the caliper and hold and release the brake lever alternatively until the old brake fluid is entirely drained out.
Close the drain valve and add specified brake fluid into the brake master cylinder.



⚠ CAUTION

To reuse the spent brake fluid will effect brake performance.

Connect one end of transparent hose to the drain valve, and put the other end into a container.
Open the drain valve around 1/4 turns, and at the same time hold the brake lever until the there is no air bubble in the drain hose and also feeling resistance on the brake lever.
Close the drain valve when finishing the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not. If brake is still soft, please bleed the system as described below.



1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

⚠ CAUTION

- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air entering into the system.

2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose. Tightly close the drain valve.
4. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.
5. Cover the cap.

BRAKE CALIPER

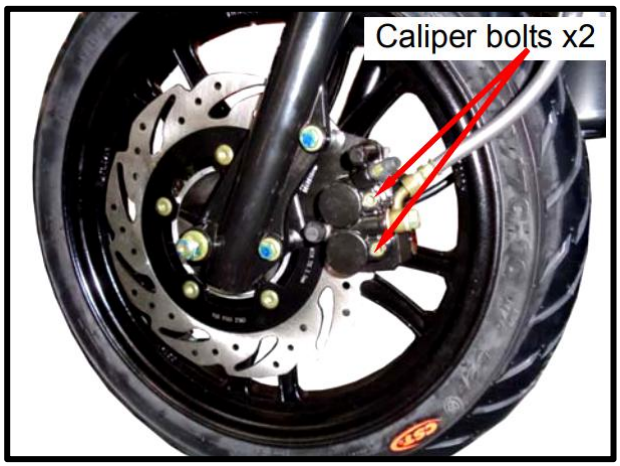
Removal

Place a container under the brake caliper, and loosen the brake hose bolt and finally remove the brake hoses.

⚠ CAUTION

- Do not spill brake fluid on painted surfaces.

Remove two caliper bolts and the caliper.

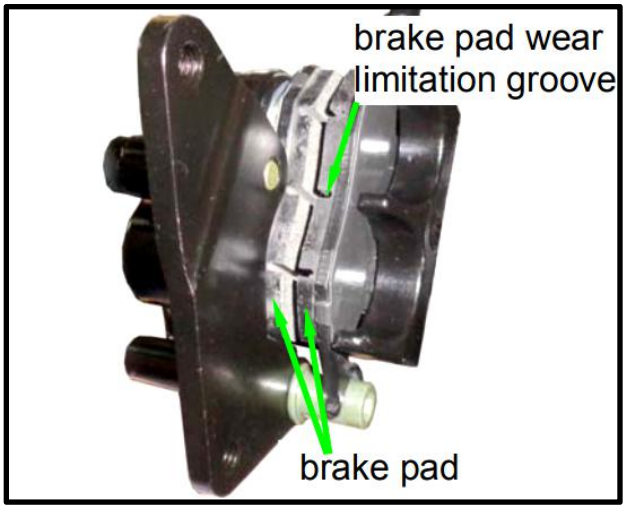


Make sure the brake lining condition. Replace the lining if the brake lining wear limitation groove close to the brake disc.

Brake Lining Replacement

Compress the caliper and let the brake lining out of the caliper mounting plate. Compress the brake lining locking spring. Remove the inner brake lining firstly and then remove the outer brake lining.

Compress the brake caliper at first as installation. Install the inner brake lining firstly, and then install the outer brake lining.



INSTALLATION

Install the brake caliper and tighten the attaching bolts securely.

Torque: 3.3 kgf-m

⚠ CAUTION

- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disc.

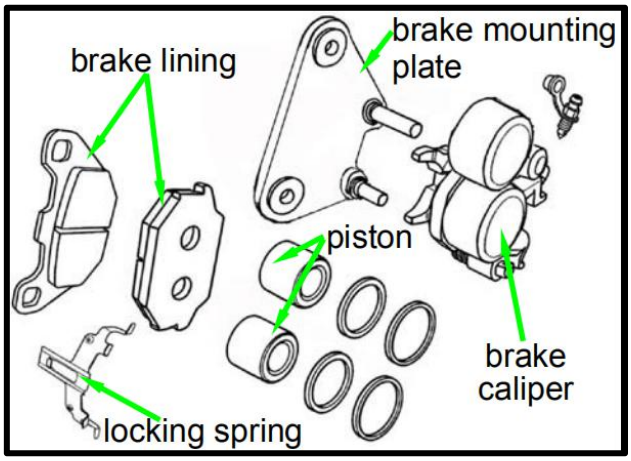
Tighten the lining guide bolt.

Torque: 1.8 kgf-m

Use two seal washers and hose bolts to lock the hose and brake caliper in place.

Torque: 3.5 kgf-m

Refill up the brake fluid to the reservoir and make necessary air bleeding.



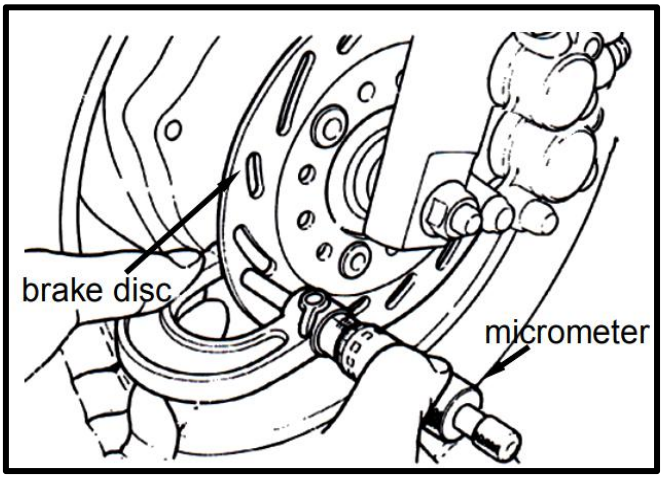
BRAKE DISC

Inspection

Visually check the brake disc for wear or break.

Measure the thickness of the disc at several places. Replace the disc if it has exceeded the service limit.

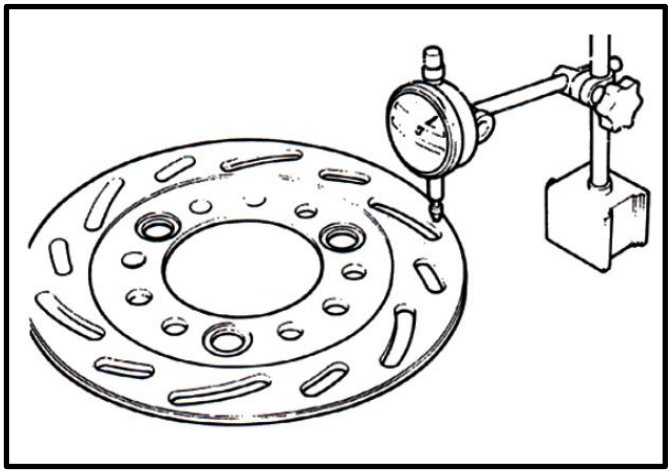
Allowable limit: 2.0 mm



Remove the brake disc from wheel.

Check the disc for deformation and bend.

Allowable limit: 0.30 mm



⚠ CAUTION

- Do not let grease touch to the brake disc that will cause brake performance.
- Do not clean the brake lining with air gun. Operator should wear mask & glove and use vacuum cleaner to clean the brake lining.

BRAKE MASTER CYLINDER

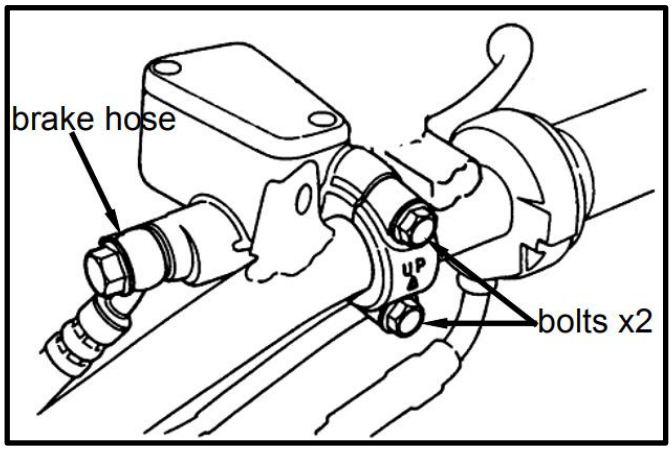
Removal

⚠ CAUTION

Do not let foreign materials enter into the cylinder.

⚠ CAUTION

The whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced after removal.



Remove the front and rear handlebar guards.

Remove the leads of brake lamp switch.

Drain out the brake fluid.

Remove the brake lever from the brake master cylinder.

Remove the brake hose.

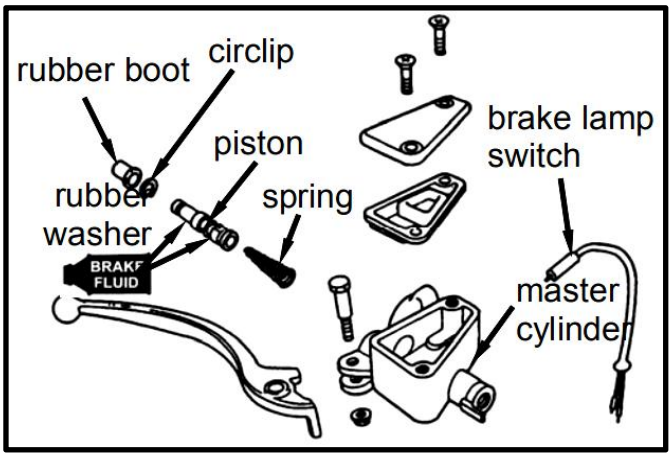
Remove the master cylinder seat and the master cylinder.

Remove the rubber pad.

Remove the circlip.

Remove the piston and the spring.

Clean the master cylinder with recommended brake fluid.



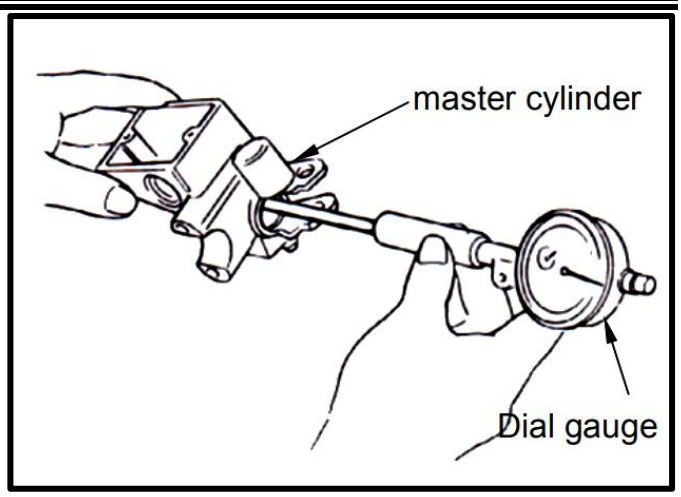
Inspection

Check the master cylinder for damage or scratch. Replace it if necessary.

Measure the cylinder inner diameter at several points along both X and Y directions.

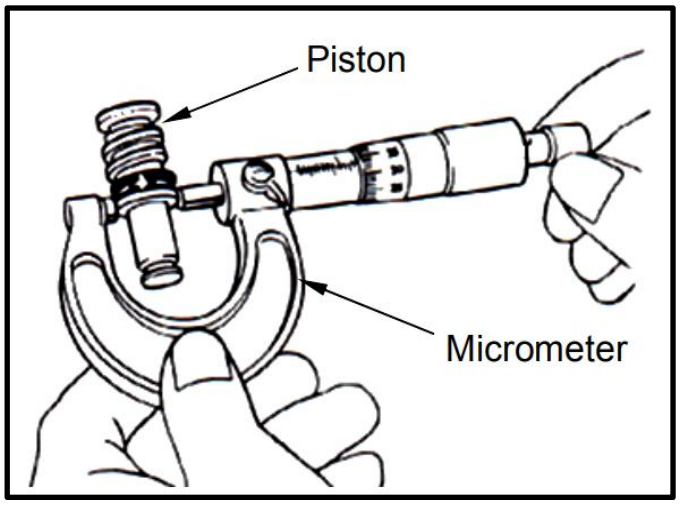
Replace the cylinder if the measured values exceed allowable limit.

Allowable limit: 11.055 mm



Measure the outer diameter of the piston. Replace the piston if its measured value exceeds allowable limit.

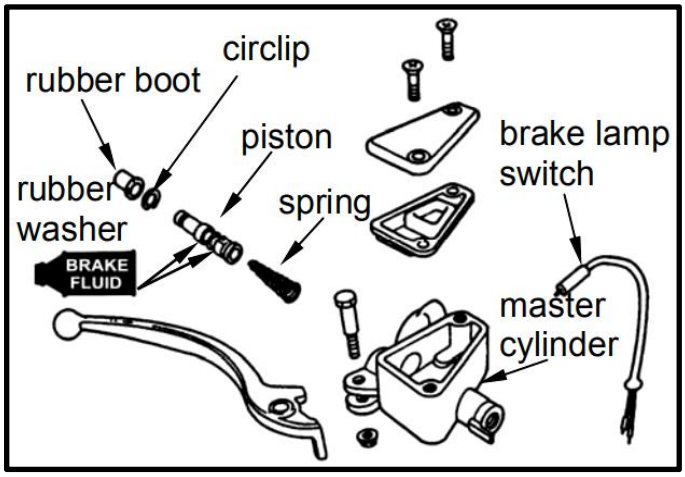
Allowable limit: 10.945 mm



Assembly

⚠ CAUTION

- It is necessary to replace the whole set comprising piston, spring, piston cup, and circlip.
- Make sure there is no dust on all components before assembling.



Apply clean brake fluid to the piston cup, and then install the cup onto the piston.

Install the larger end of the spring onto the master cylinder.

The master cup's cavity should be face inside of master cylinder when installing the master cup.

Install the circlip.

⚠ CAUTION

- Never install cup lip in the opposite direction.
- Make sure the circlip is seated securely in the groove.

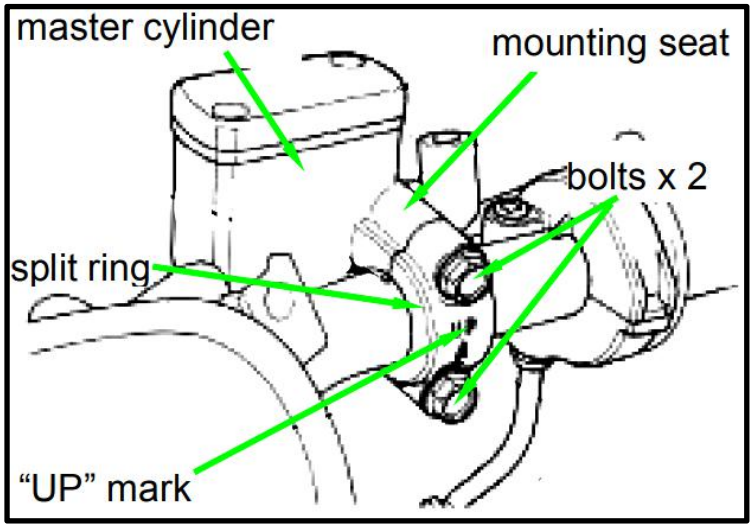
Install the rubber pad into groove properly.

INSTALLATION

Place the master cylinder onto handlebar, and install the split ring and bolts. The "UP" mark on the split ring should face upward.

Align the split ring on the master cylinder seat with the alignment point on the handlebar.

Tighten the upper bolt of the seat to specified torque value, and then tighten lower bolt to the same specified torque value.



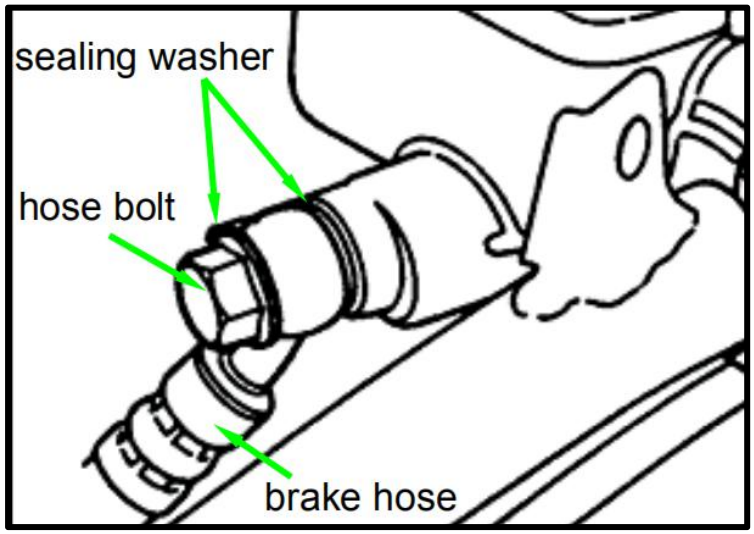
Install the brake lever, and connect leads to brake lamp switch.

Connect brake hoses with 2 new washes.

Tighten the brake hose bolt to the specified torque value.

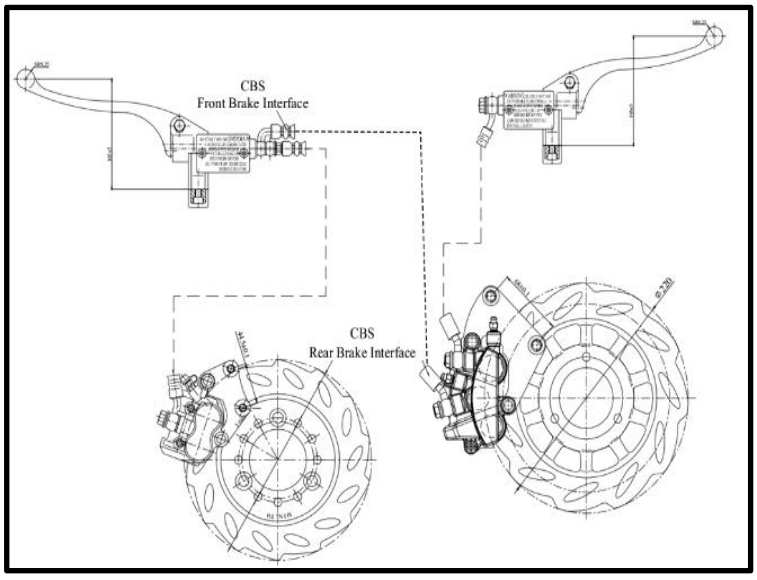
Torque value: 3.5 kgf-m

Make sure the hose is installed correctly.



CBS CONTROL VALVE ASSY

Add specified brake fluid and bleed the system and conduct the air-bleeding job for the system.



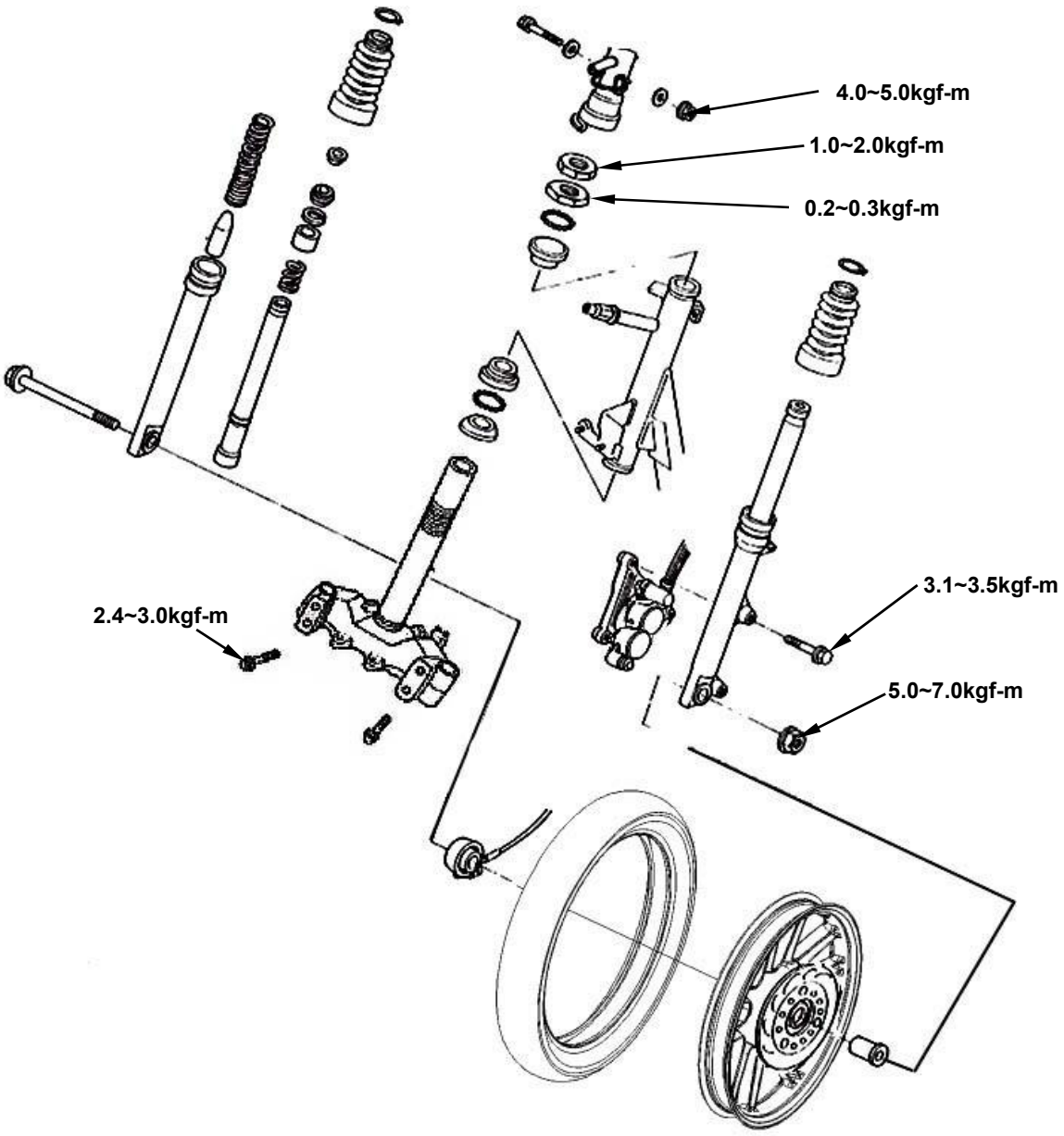
⚠ CAUTION

Improper routing may damage leads, hoses or pipes.
Kink of brake leads, hose or pipe may reduce brake performance.

14. STEERING/FRONT WHEEL/FRONT SHOCK ABSORBER

CONTENTS

MECHANISM DIAGRAM



PRECAUTIONS IN OPERATION

General Information

- Before remove front wheel, use a jack to lift the body until front wheel free of ground, and take care not to rotate body in reverse.
- Be careful not to allow oil or grease get on brake drum or linings.

Torque values

Front wheel axle	5.0~7.0kgf-m
Steering handlebar nut	4.0~5.0kgf-m
Steering column top cone sliding ring	0.2~0.3kgf-m
Steering column lock nut	1.0~2.0kgf-m
Speedometer cable nut	0.15~0.3kgf-m
Front shock absorber: Upper nut	2.4~3.0kgf-m

Tools

Special service tools

Steering column wrench
Bearing remover
Inner type bearing remover
Attachment, 32x35 mm
Attachment, 42x47 mm
Steering column nut wrench
Steering column top cone ring nut wrench

TROUBLE DIAGNOSIS

Hard steering stem

- Over tightening of steering stem lock nut
- Broken steering stem steel ball and cone bearing seat
- Insufficient tire pressure

Steering stem off center

- Uneven left/right cushion
- Bend fork
- Bent front wheel/tire offset

Front wheel wobbling

- Deformed rim
- Front wheel bearing loose
- Faulty tire
- Wheel axle nut tightened improperly

Soft front suspension

- Weak fork springs
- Oil leakage of the shock absorber seal

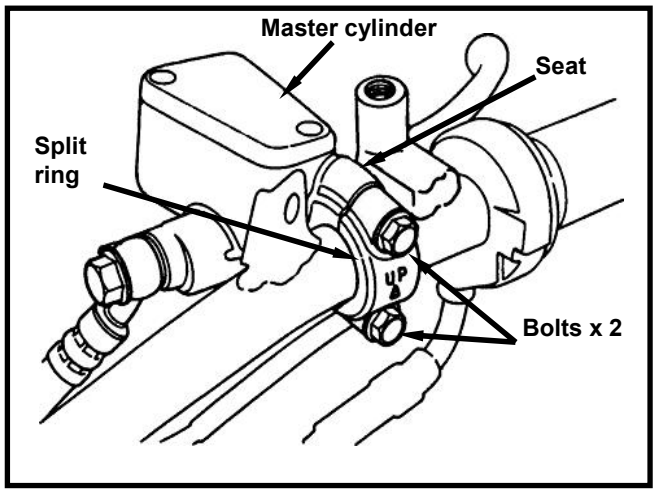
Front suspension noise

- Cushion cover friction noise
- Cushion bolts loose

STEERING HANDLE

REMOVAL

Remove handle front & rear covers and the front cover (refer to chapter 12).



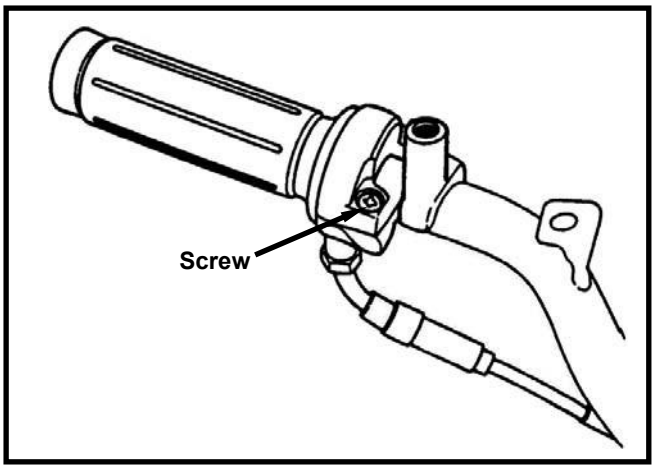
Front Disc Brake

Remove the 2 bolts of the brake master cylinder, and then take out the master cylinder and the split ring.

⚠ Caution

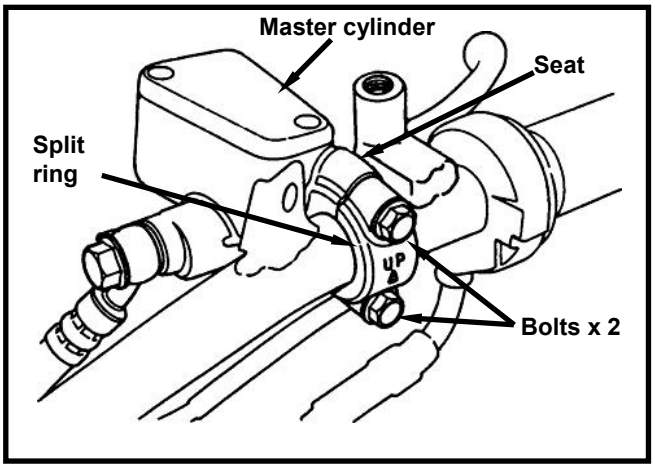
Do not operate the front brake lever to avoid to pressing out the brake lining when removing the master cylinder.

Remove acceleration handlebar screw and then remove the handlebar, acceleration cable, and handlebar cover & seat.

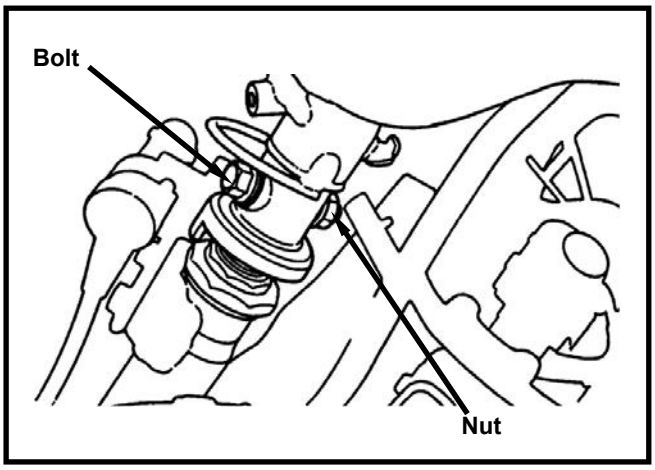


Rear Disc Brake

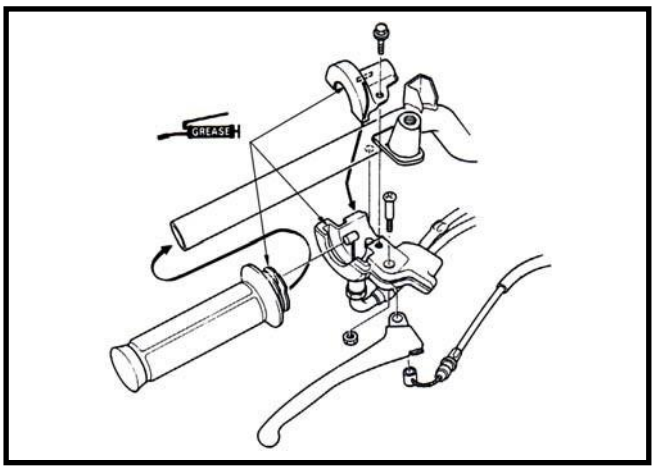
Remove the 2 bolts of the brake master cylinder, and then take out the master cylinder and the split ring.



With a wrench to hold the handlebar bolt and then remove the nut.
Take out the handlebar after removed the bolt.

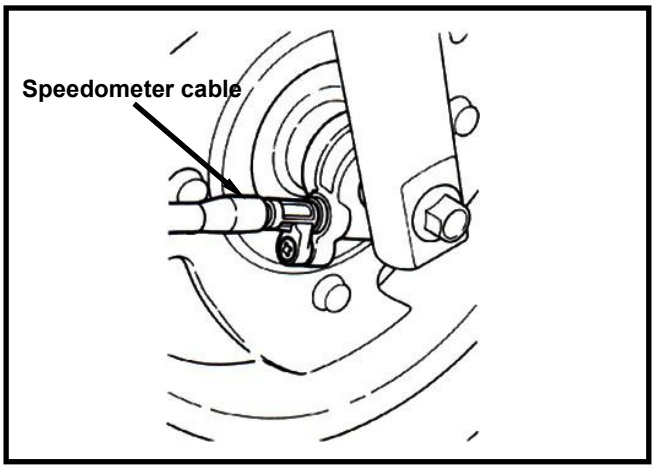


Installation
Install the handlebar according to the reverse procedure of removal.
Apply with some grease onto the handlebar moving parts when installing the acceleration handlebar seat, acceleration handlebar, and acceleration cable.



FRONT WHEEL

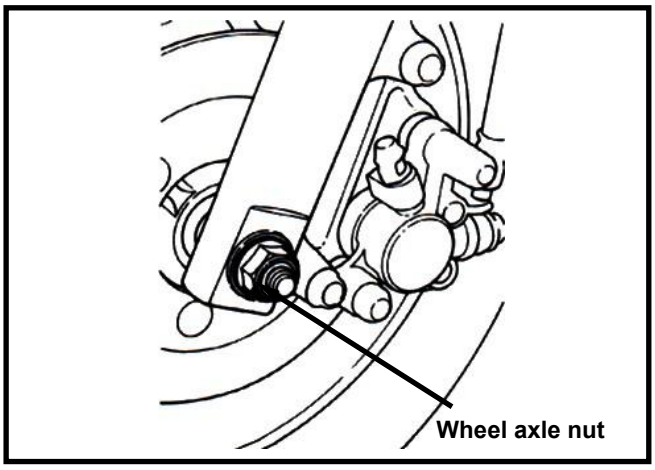
Removal
Disc Brake type
Support body bottom and lift front wheel free of ground.
Remove the bolts, and disconnect speedometer cable from the gear box.



Remove the wheel axle nut and pull out the axle. Then, remove the front wheel.

⚠ **Caution**

Do not operate the front brake lever to avoid to pressing out the brake lining when removing the master cylinder.

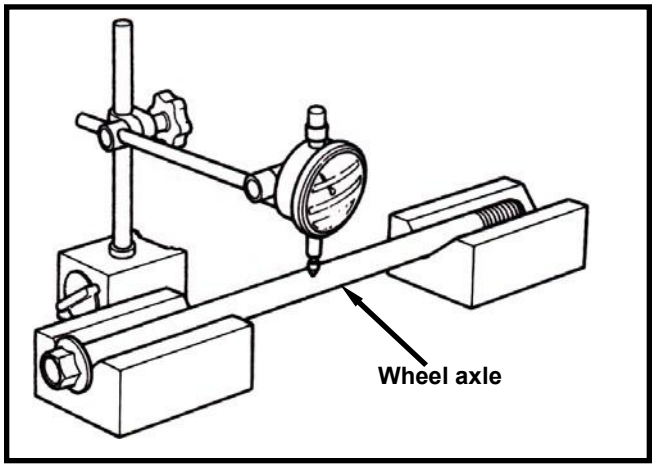


Inspection

Wheel axle

Set the axle in V-blocks and measure the run-out.

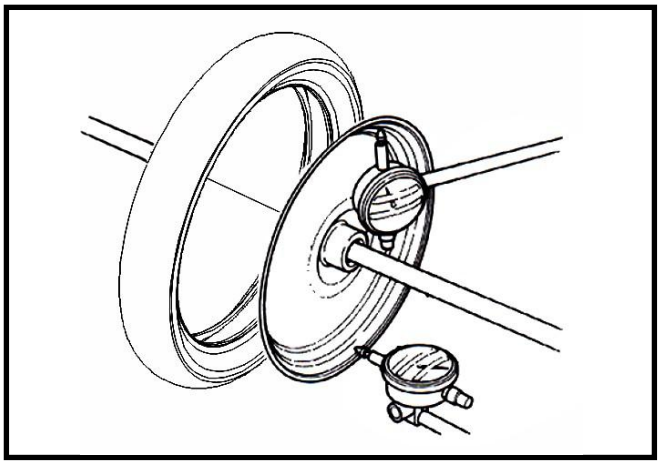
Service limit: 0.2 mm.



Wheel Rim

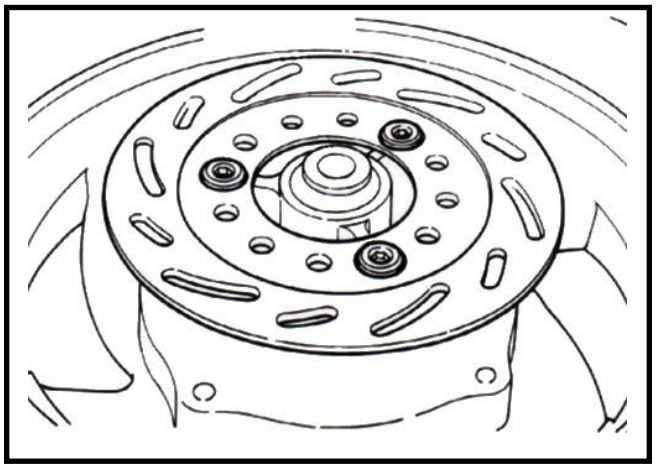
Place the wheel onto a rotated bracket. Turn the wheel with hand and measure its wobble value with a dial gauge.

Service limit:
Radial : 2.0 mm
Axial : 2.0 mm



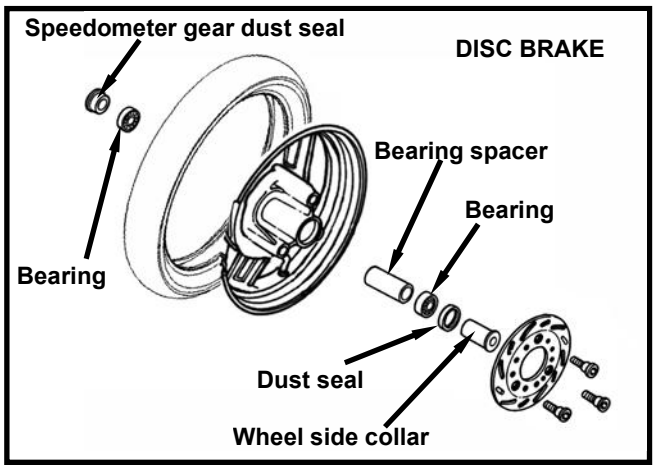
Disassembly (Disc type)

Remove 3 hex socket bolts and brake disc.

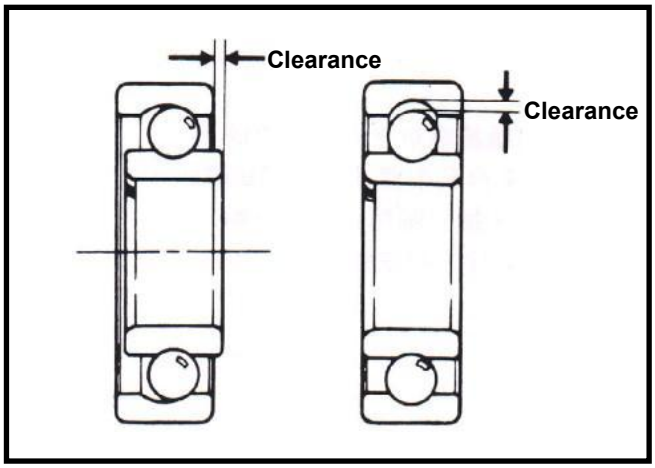


Remove the left axle ring and dust seal.
Remove the dust seal on the right side of speedometer gear.
Remove the bearing with the inner type bearing remover.
Take out the bearing spacer and then remove the other bearing.

Tool:
Inner type bearing remover



Bearing Inspection
Turn the inner race of bearing with fingers. The bearing should be turn smoothly. Also check if the outer collar is tightly connected to the wheel hub.
If the bearing do not turn smoothly, or if they are too loose in the races, or damaged, then, remove and replace the bearings with new ones.



⚠ **Caution**

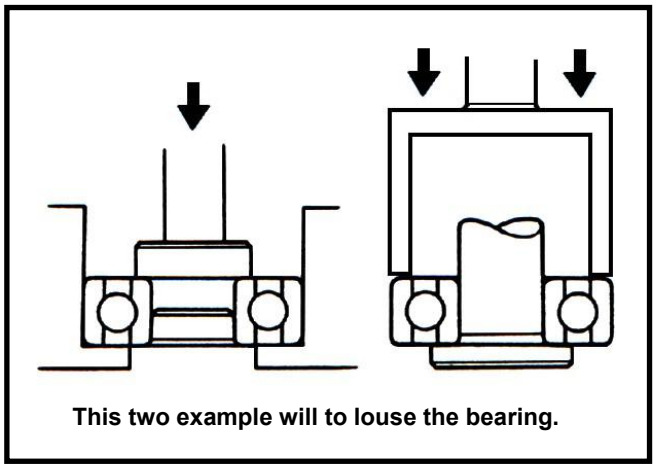
The bearing must be replaced in pair.

Installation
Install the bearing according to the reverse procedure of removal.
Apply some grease into the bearing seat of the wheel hub.
Install the left bearing onto the seat.
Install the bearing spacer and then install the right bearing onto the seat.

⚠ Caution

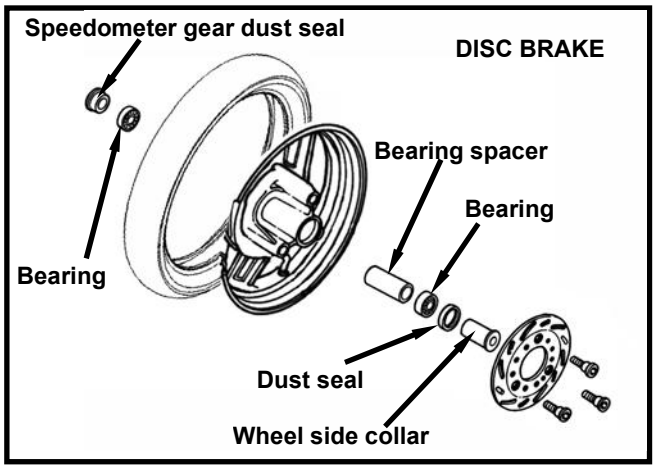
- Do not install used bearing and replace the bearing once it has been removed.
- Do not the bearing in tile motion when installing.

Tool:
C-type compressor or bearing compressor.



This two example will to louse the bearing.

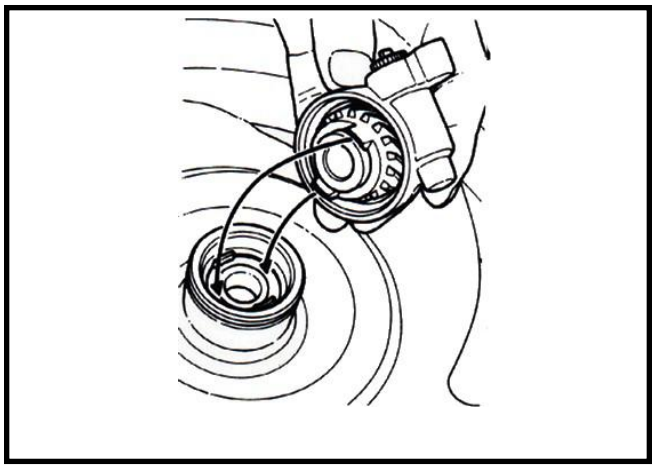
Disc Brake
Apply with some grease inside of the dust bearing.
Install the dust seal and the front wheel side collar.
Apply with some grease on both side of the speedometer gear oil seal, and then install the seal.



Align the flange part on the speedometer gear with the slot of wheel hub, and then install the brake disc (drum brake) or speedometer gear box.

⚠ Caution

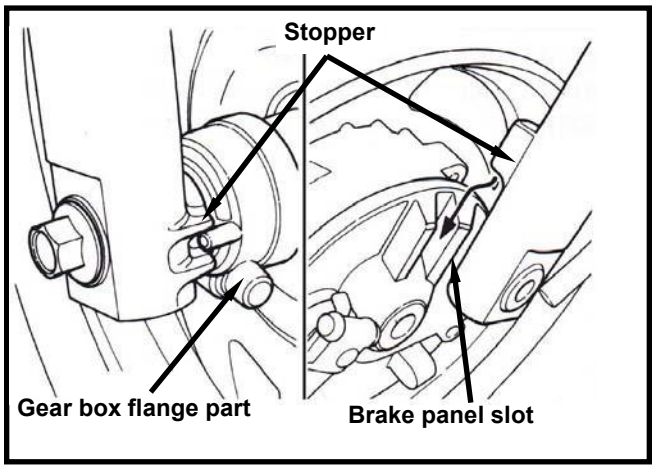
Contaminated brake lining will reduce brake performance so the brake lining, brake drum and disc must be free of grease.



Place the front wheel between the front shock absorbers.

Disc Brake

Align the flange part on the speedometer gear with the slot of shock absorber stopper.



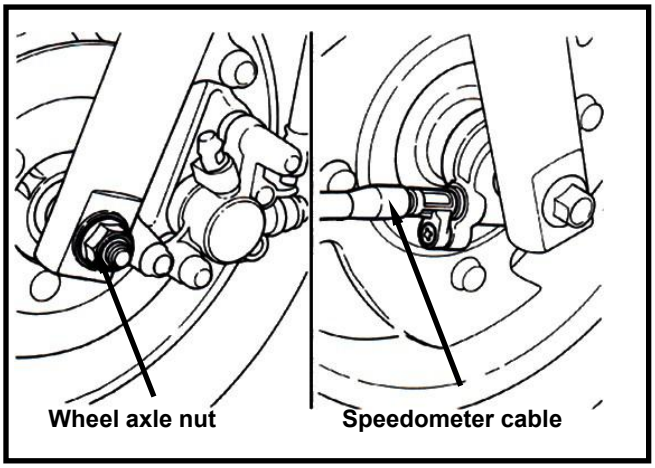
Disc Brake

Install the front wheel axle from right shock absorber side.

Install the wheel axle nut, and tighten it to specified torque value.

Torque value: 11.0~13.0kgf-m

Connect the speedometer cable to the speedometer gear box.



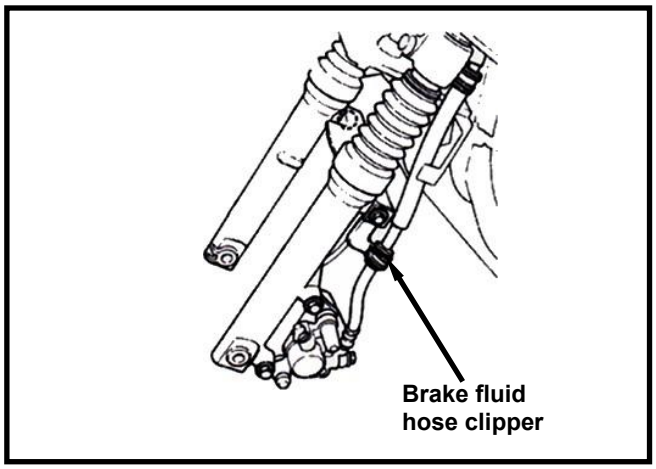
FRONT SHOCK ABSORBER

Removal

Remove the front fender, front lower spoiler, front guard, and front wheel as well as front brake components.

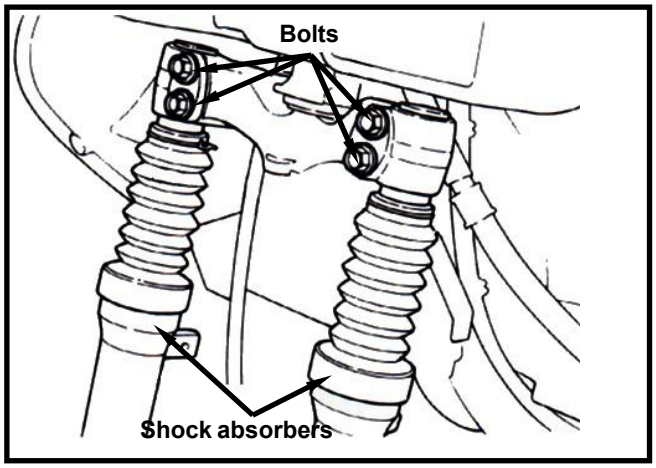
Remove the brake fluid hose clipper or cable guide on the left shock absorber. (bolt x 1)

As for disc brake, remove the cable guide on the right shock absorber. (bolt x 1)



Remove the top connection bolt of the right shock absorber. (bolt x 4)

Remove the shock absorber from the front fork.

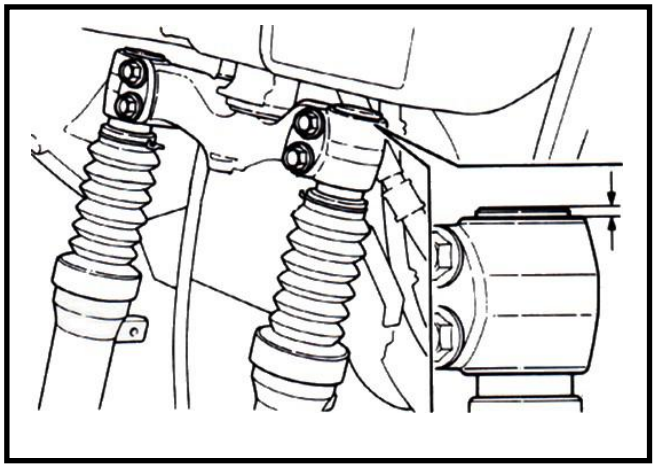


Installation

Install the shock absorbers according to the reverse procedure of removal.

Align the shock absorber top-edge with the top-end level of the front fork when installing the front shock absorber onto the front fork. Then, tighten the nut.

Torque value: 2.4~3.0kgf-m



FRONT FORK/STEERING COLUMN

Removal

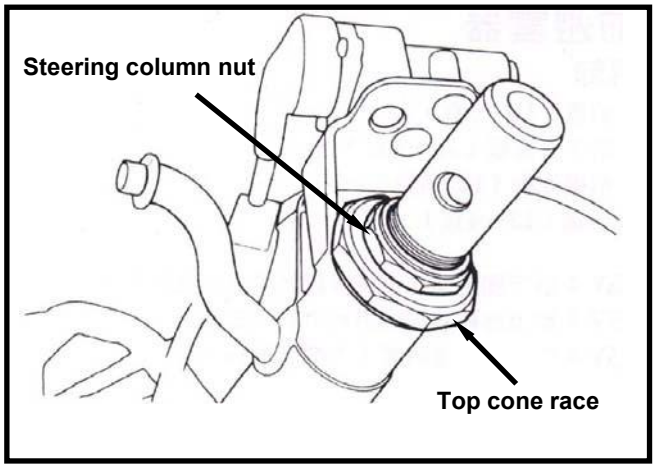
Firstly, remove the handlebar, front wheel, front brake set, and front shock absorbers.

Remove the steering column nut.

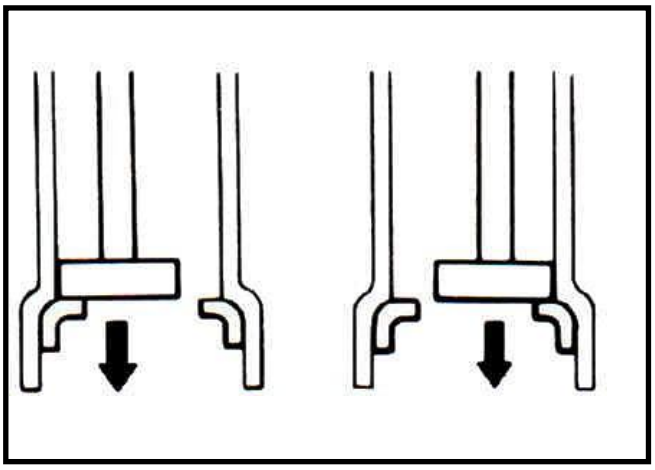
Remove the top cone ring, and then remove the steering column.

⚠ Caution

Place the steering column bearing balls into a parts container to avoid to missing or shortage.



With a plastic hammer to tap the steering column slightly, and then remove the top ball bearing seat.
Remove the lower-end cone bearing seat on the frame with a punch.



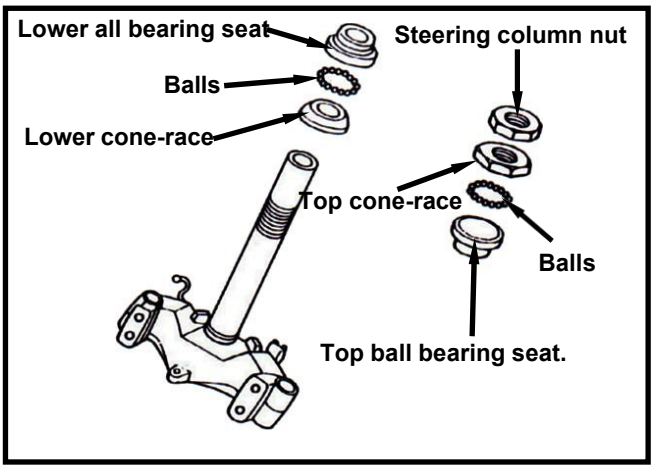
⚠ Caution

Do not damage the frame and the steering column.

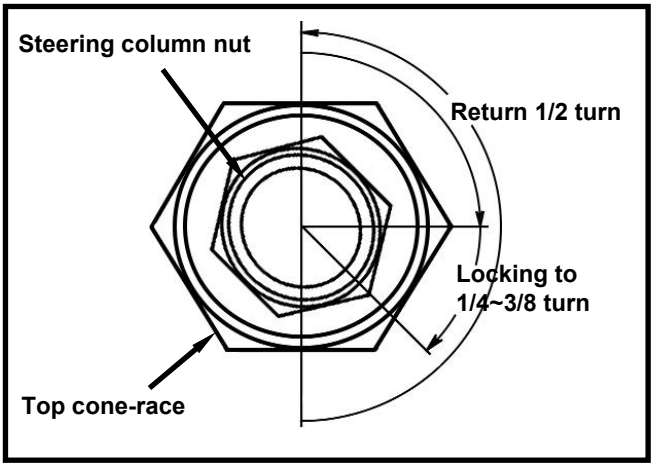
Installation
Install a new top-cone bearing seat onto the top of steering column.
And then, push the lower-cone bearing seat from bottom until to locking position.

⚠ Caution

Do not let the ball bearing in title motion as installation.



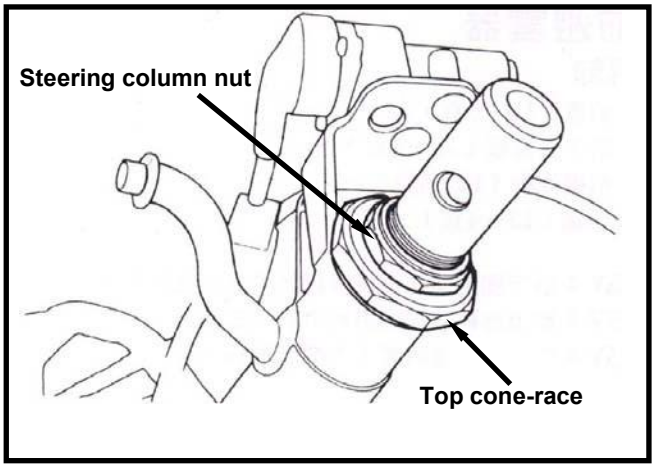
Apply with some grease onto the top & bottom bearing balls, and then install the balls into bearing seat.
Press in a new lower cone-race onto the steering column, and lubricate it with grease.
Install the steering column.
Lubricate the top-cone race with grease.
Drive the cone-race into the steering column until contact with the top bearing seat no clearance. Note, return 1/2 turn and then tighten the top cone race to specified torque. (tighten the race around 1/4~3/8 turn more.)
Torque value: 0.2~0.3kgf-m



⚠ Caution

Do not tighten the top cone race too tight to prevent from damage the ball bearing seat when tightening the top cone race.

Install the steering column nut and lock the top cone race. Then, tighten the nut.
Torque value: 1.0~2.0kgf-m
Install the bearing seat according to the reverse procedure of removal.



⚠ Caution

Check the steering column if it can be turned freely and no clearance in vertical motion.

15. REAR WHEEL/REAR SHOCK ABSORBER

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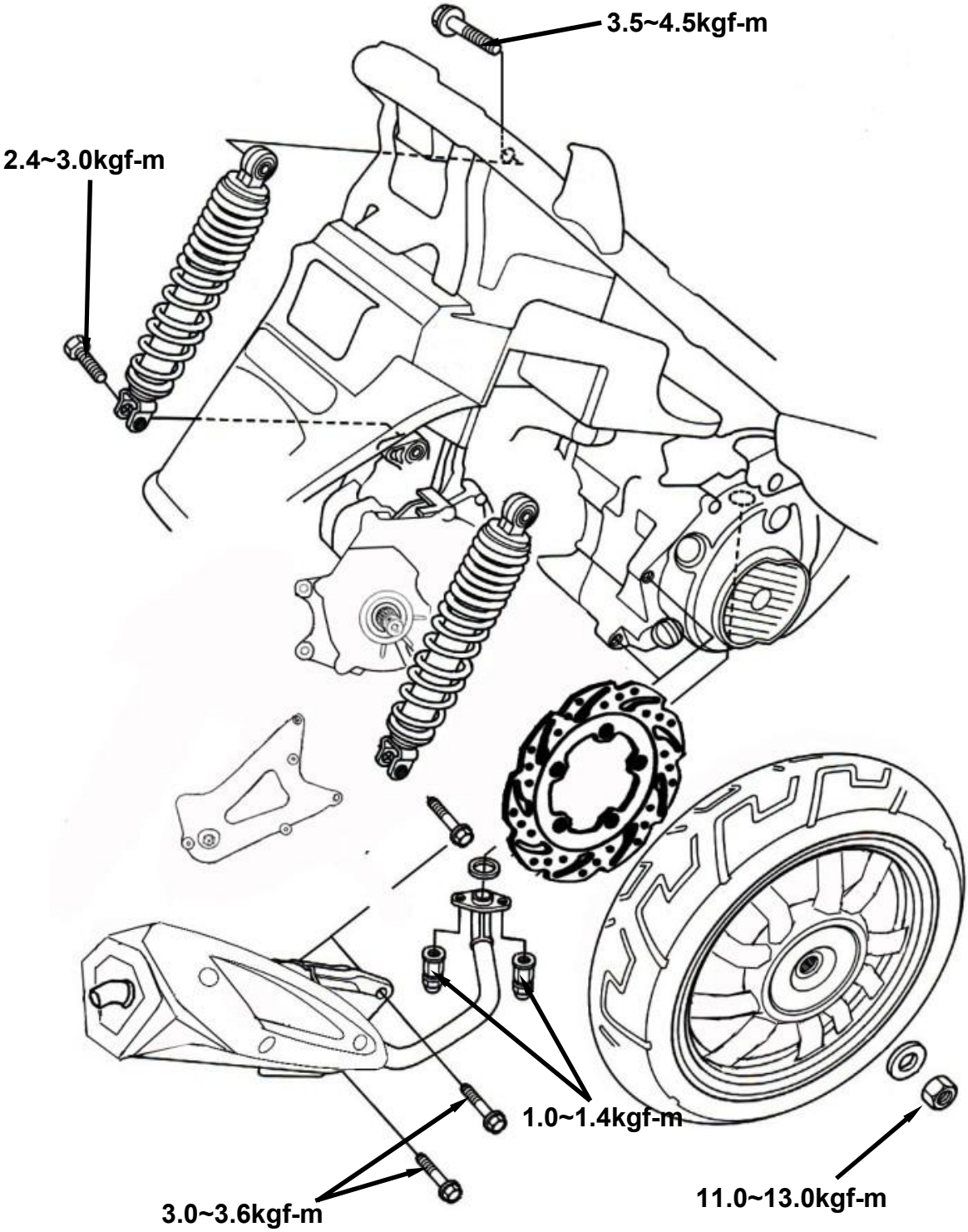
MECHANISM DIAGRAM



15. REAR WHEEL/REAR SHOCK ABSORBER

PRECAUTIONS IN OPERATION

General Information

As for the wheel removal, service, and installation procedures, please refer to the service manual of high speed tire.

Specification **Unit: mm**

Items		Standard	Limit
Wheel wobbling	Radial	-	2.0
	Axial	-	2.0
Thickness of rear brake lining		4.0	2.0

Torque values:

Rear axle nut	11.0~13.0kgf-m
Rear shock absorber upper mount bolt	3.5~4.5kgf-m
Rear shock absorber lower mount bolt	2.4~3.0kgf-m
Exhaust muffler connection nut	1.0~1.4kgf-m
Exhaust muffler connection bolt	3.0~3.6kgf-m

TROUBLE DIAGNOSIS

Rear wheel wobbling
- bend wheel rim
- poor tire
- loosen wheel shaft

Shock absorber too soft
- insufficient shock absorber spring force

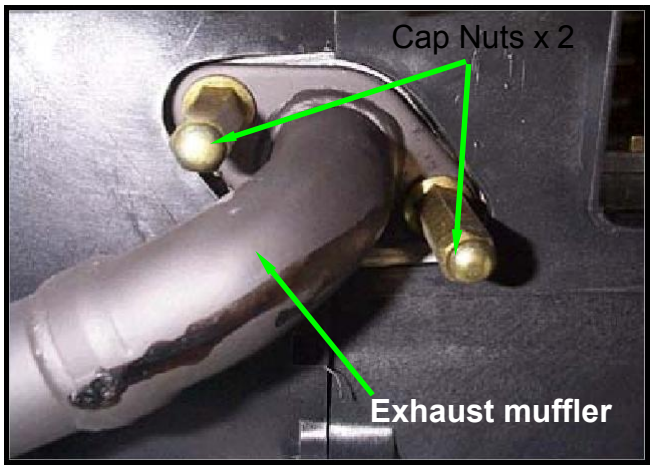
Braking Noise
- worn brake lining
- brake drum deformation
- improperly brake panel installation
- unparalleled brake drum or wheel unparallel.

Poor brake performance
- Poor brake adjustment
- contaminated brake lining
- worn brake lining
- greased brake drum
- contaminated and seized brake cable
- improperly installation of brake cable

EXHAUST MUFFLER

Removal

Remove the front-end nut of the exhaust muffler. (nuts x 2)
Remove the bolts. (bolts x 3)
Remove the exhaust muffler.



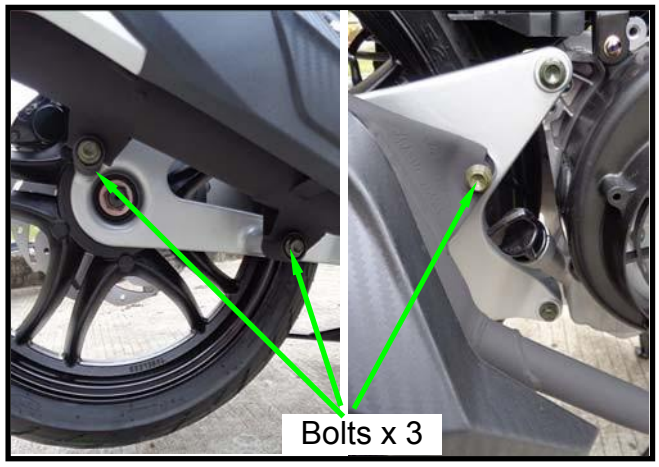
Installation

Install the exhaust muffler according to the reverse procedure of removal.

⚠ Caution

Replace the exhaust muffler gasket if it is broken or deformed.

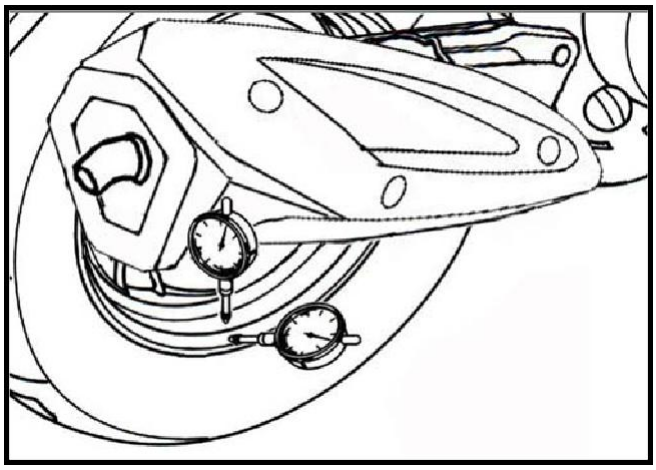
Torque value:
Exhaust muffler connection bolt:
3.0~3.6kgf-m



REAR WHEEL

Inspection

Measure wheel rim wobbling.
Service limit:
Radial: 2.0mm
Axial: 2.0mm
If the wheel rim wobbling out of the specification, except resulted from the wheel rim deformation, it might be loosen or worn final driving shaft bearing or bend, deformed driving shaft.



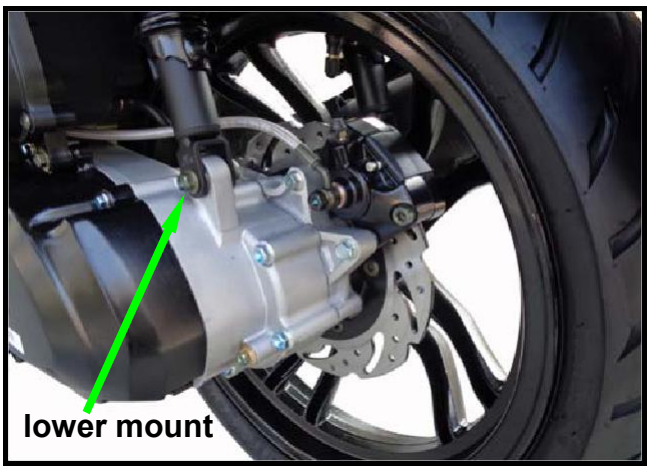
Removal

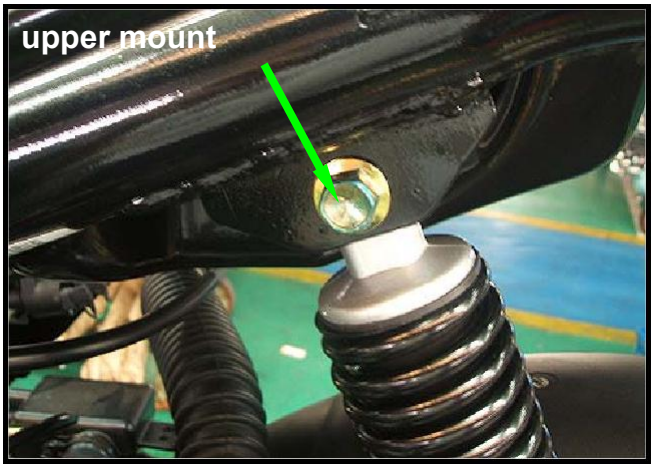
Remove the rear inner mudguard. (Bolt x 1)
Remove the exhaust muffler bracket. (bolts x 3)
Remove the rear disk brake caliper. (bolts x2)
Remove the rear wheel. (wheel axle nut x1)

REAR SHOCK ABSORBER

Removal

Remove the luggage box. (bolts x 4)
Remove the rear carrier. (bolts x 3)
Remove the left & right body covers. (screws x 4, bolts x 3)
Remove the air cleaner bolts (bolts x2)
Remove the lower nut of the rear shock absorber (bolt x 1)
Remove the upper nut of the rear shock absorber (bolt x 1)
Remove the rear shock absorber.





Installation

Install the rear shock absorber according to the reverse procedure of removal.

⚠ Caution

The rear shock absorber has to be replaced with one set and can not be replaced by unauthorized persons. Otherwise, it might damage the rubber bushing and construction.

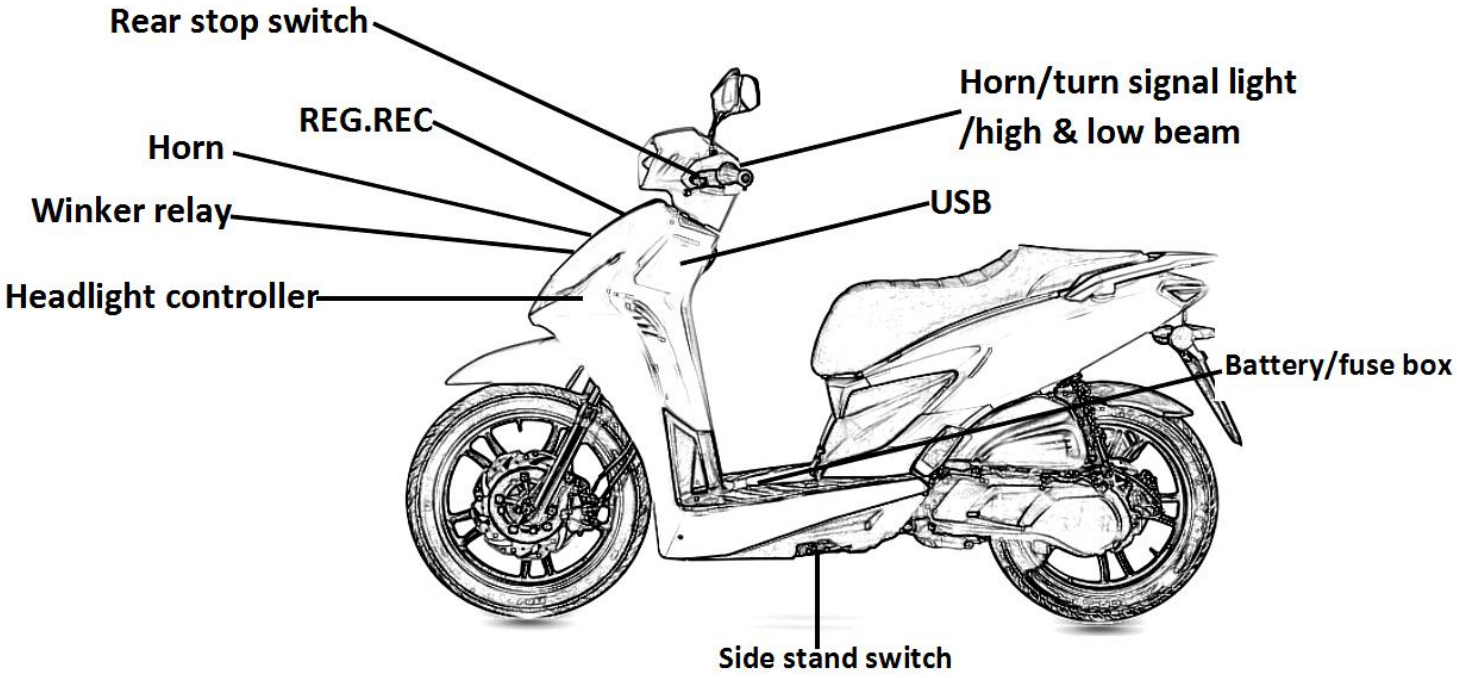
Torque values

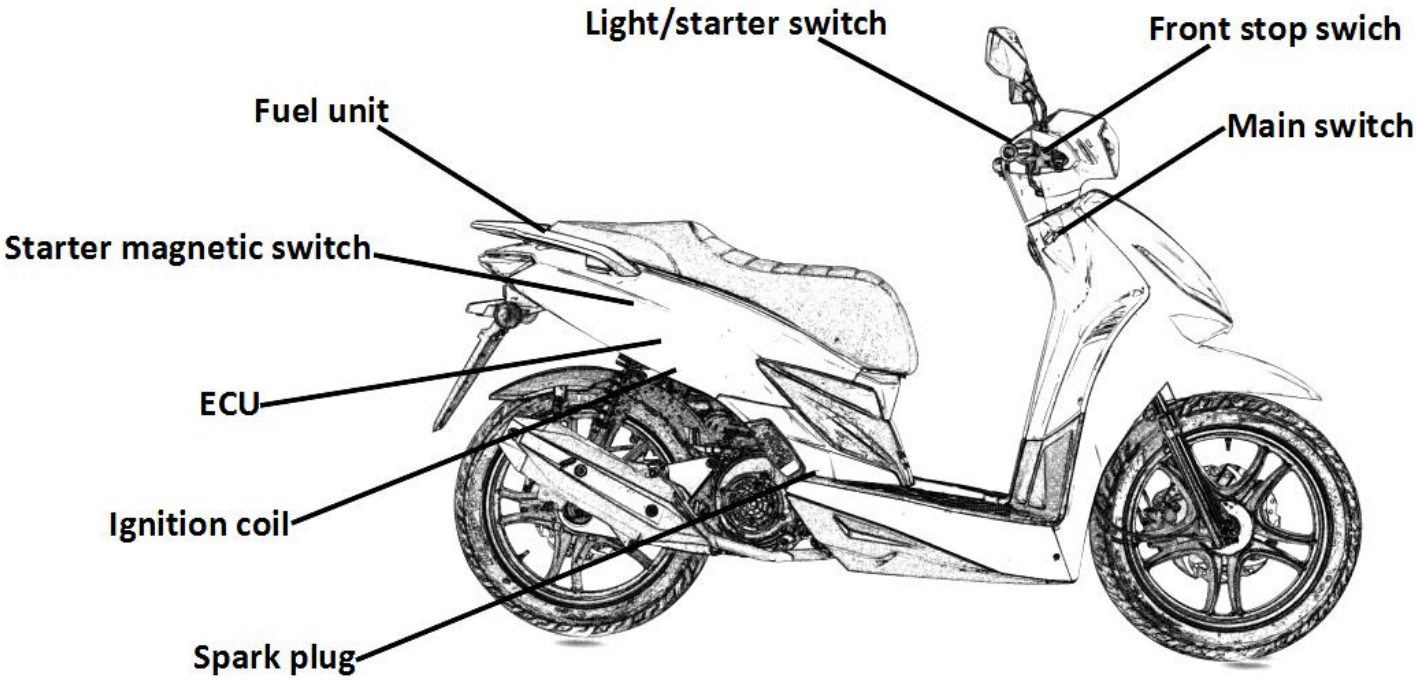
Rear shock absorber lower mount bolt:
2.4~3.0 kgf-m
Rear shock absorber upper mount bolt:
3.5~4.5 kgf-m

16. ELECTRICAL EQUIPMENT

CONTENTS

MECHANISM DIAGRAM





PRECAUTIONS IN OPERATION

Charging System

- When remove the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- MF (Maintenance Free) battery does not need to check, add electrolyte or distilled water.
- Battery must be taken out from scooter when charging the battery. But do not open the battery caps.
- Do not quick charge the battery unless in emergency.
- A voltmeter must be used when checking battery charging condition.
- Battery can be charged or discharged alternately. To set a discharged battery idle for a prolonged period will shorten its service life and reduce its capacity. Usually, battery's capacity will reduce after 1~2 years. After low capacity battery was charged, its voltage will increase. If it connects to an additional load, the voltage will reduce suddenly, and then go up again.
- Over-charged battery. Usually, the over-charged battery can be seen externally. If a short circuit occurred inside the battery, there will be no voltage on the terminals of battery if voltage regulator does not operate. Then, the battery's voltage will be too high that may reduce battery's life.
- The battery will be self-discharged if it was set idle for a long time. An idle battery must be charged about every 2months.
- A new battery filled with electrolyte will generate a voltage after filled out electrolyte. The voltage should be in 12.5V or more after 10 minutes. When electrolyte is not enough, the battery must be filled with electrolyte and then charged to prolong the battery's life-span.
- Please check electrical device according to the procedure of diagnosis chart.
- Do not disconnect and connect the connector of electrical devices when current is passing these devices because this will generate high voltage and the electrical components in the voltage-current regulator will be damaged. The ignition switch must be turned OFF before performing anywork.
- Please do not replace with traditional type battery as replacement.
- Please refer to the removal instruction when removing the alternator and the pulse generator.

Precautions in Operation

- When removing the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Adjustment of headlight.
- Removal and installation of AC generator.
- The maintenance-free battery requires no inspection of electrolyte level and refilling of distilled water.
- To recharge the battery, remove the battery from rack without removing ventilation caps.
- Unless in emergency, never rapid-charge the battery.
- The voltage must be checked with the voltmeter while charging the battery.
- As ECU assembly does not require an ignition timing check. In case ignition timing is incorrect, check ECU and AC generator. Verify with an ignition timing light after replacement if necessary.

Starting System

- Starting motor can be removed directly from engine.
- Please refer to chapter 10 for starting clutch removal procedures.

SPECIFICATION

Charging System

Items			Specification
Battery	Capacity/type		12V 6Ah
	Charging rate		STD:0.6A/5~10hrs, emergency charging: 6A/0.5hrs
	Voltage (20℃)	Full charged	13.5V
		Under charged	12.3V
Alternator	Capacity		12V / 6.2A
	Lighting coil resistance (20℃)		Between yellow-green: 0.8±0.1Ω
	Charging coil resistance (20℃)		Between white-green: 0.6±0.1Ω
Leaking current			Less 1mA
RPM for starting charging			1700rpm(headlight ON)
Voltage controlled by regulator			14.5±0.5 V

Ignition System

Item		Specification
Spark plug	Standard	NGK CR7HSA (Recommended usage)
	Hot type	NGK CR8HSA
	Cold type	NGK CR6HSA
	Spark plug gap	0.6~0.7 mm
Ignition coil resistance (20℃)	Primary	0.21±10%Ω
	Secondary	With plug cap : 7.6±10%KΩ
		Without plug cap : 3.1±10%KΩ
Ignition timing	"F" Mark	Before TDC 13° / 1700 rpm
	Timing advanced character	Before TDC 28° / 4000 rpm
		Before TDC 27° / 8000 rpm
Pulse generator resistance (20℃)		50~200Ω
Exciting coil resistance (20℃)		400~800Ω
Ignition coil-primary max. voltage		95~400 V
Pulse generator voltage		1.7 V above
Exciting coil voltage		95~400 V

Starting System

Item		Specification
Starting motor	type	DC TYPE
	capacity	0.5 KW

TROUBLE DIAGNOSIS

No voltage
- Battery discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch
- Low voltage
- The battery is not fully charged
- Poor contact
- Poor charging system
- Poor voltage regulator

No spark produced by spark plug
- The spark plug is out of work
- The cable is poorly connected, open or short-circuited
- Poor connection between ECU and ignition coil
- Poor connection between ECU and the main switch
- Poor main switch
- Poor ECU.
- A.C.G. is out of work

Starter motor does not work
- The fuse is blown
- The battery is not fully charged
- Poor main switch
- Poor starter switch
- The front and rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The starter motor is out of work

Intermittent power supply
- The connector of the charging system becomes loose
- Poor connection of the battery cable
- Poor connection or short-circuit of the discharging system
- Poor connection or short-circuit of the power generation system

Charging system does not operate properly
- Burnt fuse
- Poor contact, open or short circuit
- Poor regulator rectifier
- Poor ACG

Engine does not crank smoothly
- Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition timing
  - Poor ACG
  - Improper installation of CPS
  - Poor ECU

Weak starter motor
- Poor charging system
- The battery is not fully charged
- Poor connection in the windings
- The motor gear is jammed by foreign material

Starter motor is working, but engine does not crank
- Poor starter motor pinion
- The starter motor runs in reverse direction Poor battery

BATTERY

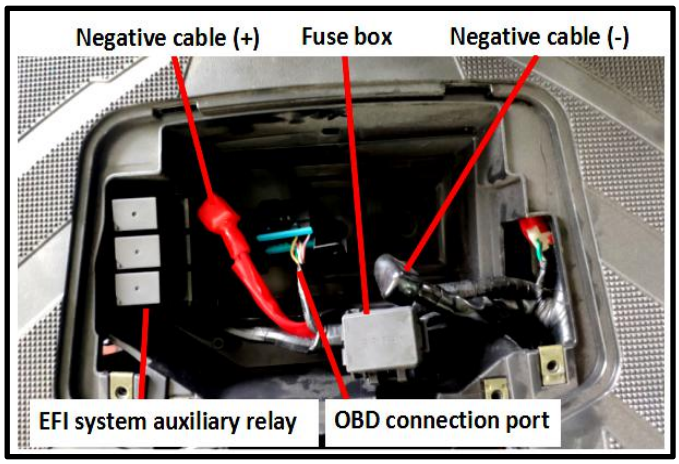
Removal

Remove the battery cover.

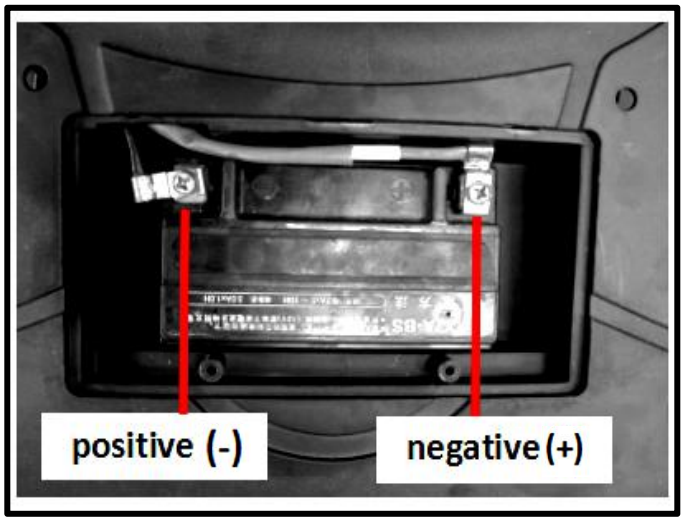
⚠ CAUTION

- Electrolyte (diluted sulfuric acid) is very toxic. Once it spreading on clothes, skin, or eyes, it will cause burned or blind. In case of being spread, flush with great quantity of water immediately, and then send to hospital.
- When clothes is spread by electrolyte, it will contact with skin. So, it must flush with great quantity water to take off the clothes.

Remove the battery cover.



Disconnect the negative (-) cable from the battery first, then the positive (+) cable. Remove the battery.



Install the battery in reverse order of removal.

⚠ CAUTION

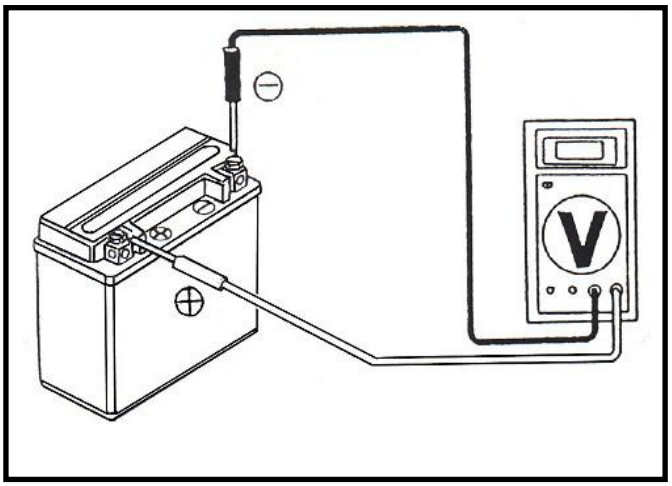
- To prevent form circuit short, connect positive(+) terminal at first, and next negative (-) terminal.

VOLTAGE CHECK

With a digital voltage meter or multi-meter to measure battery voltage.

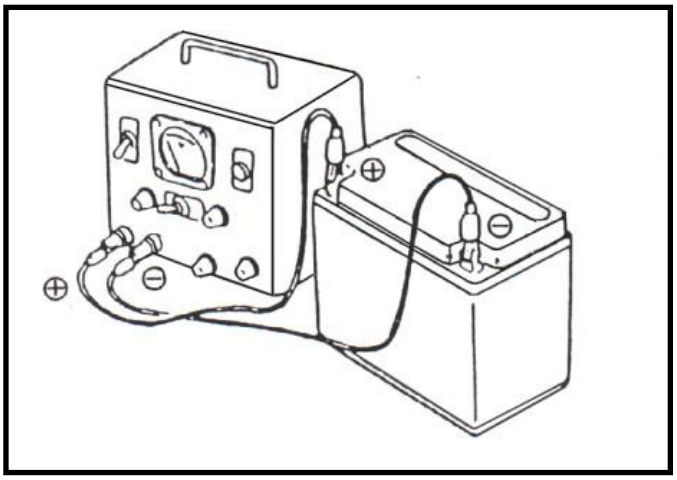
Voltage:

Fully charged: 13.0 – 13.2V (at 20℃) Undercharged: Below 12.3 V (at 20℃)



CHARGING

Connect the Charger positive (+) to the battery positive (+) terminal.
Connect the Charger negative (-) to the battery negative (-) terminal.



	Standard	Max.
Charging current	0.6A	6.0A
Charging time	5~10H	1H

⚠ Warning

- Strictly keep flames away from a charging battery.
- The charging “ON”/ “OFF” is controlled by the charger’s switch. Do not control the charging by battery jump wires.
- Turn the charger’s switch “OFF” at first before or after charging to prevent from sparks created on the connectors and explosion.
- To charge a battery must be based on the battery’s ampere-hour showed on label.

⚠ CAUTION

- Quick charge a battery should be used only in an emergency.
- Make sure the current and charging time of above description.
- The battery will be damaged by too much current or too rush charging.
- When finishing charge, it is necessary to measure voltage after 30 minutes.
- After installing the battery, coat the terminals with clean grease.

Charging Voltage/Current Inspection

⚠ Caution

- Before conducting the inspection, be sure that the battery is fully charged. Use a fully charged battery having a voltage larger than 13.1 V. If undercharged, the current changes dramatically.
- While starting the engine, the starter motor draws large amount of current from the battery. Thus, do not start the engine with battery.

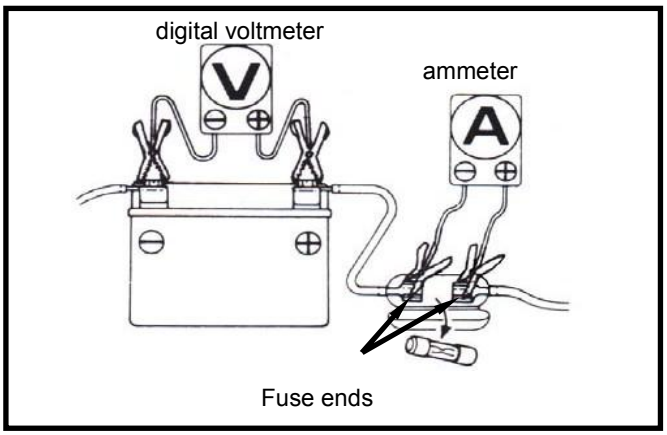
After the engine is warmed up, replace original battery with a fully charged battery.
Connect a digital voltmeter to the battery terminals.
Connect an ammeter between both ends of the main fuse.

⚠ Caution

When the probe is reversibly connected, use a voltmeter having an indication that the current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only.

⚠ Caution

- Do not use short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current of the motor draws from the battery may damage the ammeter. Use the kick lever to start the engine.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.



Connect a tachometer.
Turn on the headlight to high beam and start the engine.
Accelerate the engine gradually to the specified revolution per minute and measure the charging voltage/current.

Specified Charging Current:
(headlight OFF) 0.6 A or more/2500rpm
1.2 A or more / 6000 rpm
(headlight ON) 0.4 A or more/2500rpm
1.0 A or more / 6000 rpm
Control Charging Voltage:
14.0+/0.5 V / 2000 rpm

⚠ Caution

To replace the old battery, use a new battery with the same current and voltage.

The following problems are related to the charging system, follow the instructions provided in the checking list to correct it if any one of the problems takes place.

(1) The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.
(2) The charging voltage and current are too much higher than the standard values.

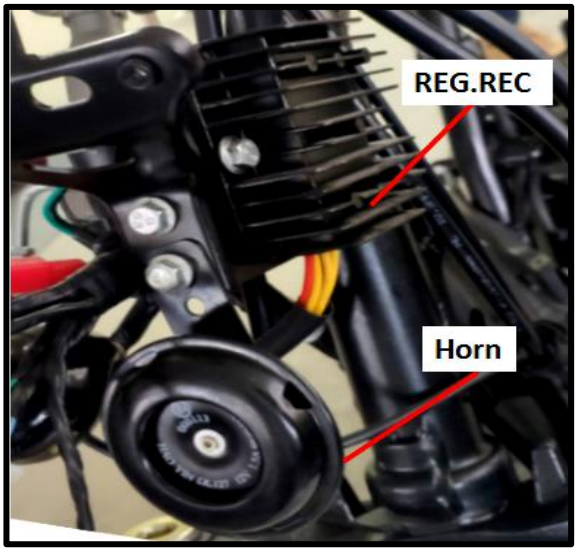
The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

(1) The standard charging voltage and current can only reach when the revolution of the engine exceeds the specified rpm.
- Bulbs used exceed their rate and consume too much power.
- The replacement battery is aged and does not have enough capacity.

(2) The charging voltage is normal, but the current is not.
- The replacement battery is aged and does not have enough capacity.
- Battery used do not have enough electricity or is over charged.
- The fuse of the ammeter is blown.
- The ammeter is improperly connected.

(3) The charging current is normal, but the voltage is not.
- The fuse of the voltmeter is blown.

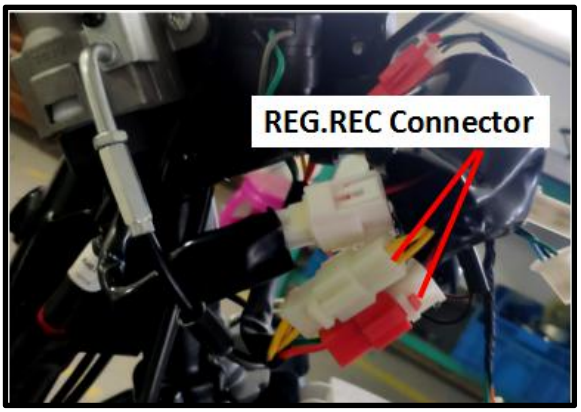
VOLTAGE REGULATOR INSPECTION



Remove the front cover. (screws 4 x 2). Remove the front cover mounting bolt(bolt x 1)and remove the left/right turnlight wiring connector.
check the continuity between main wire terminals according to following method.

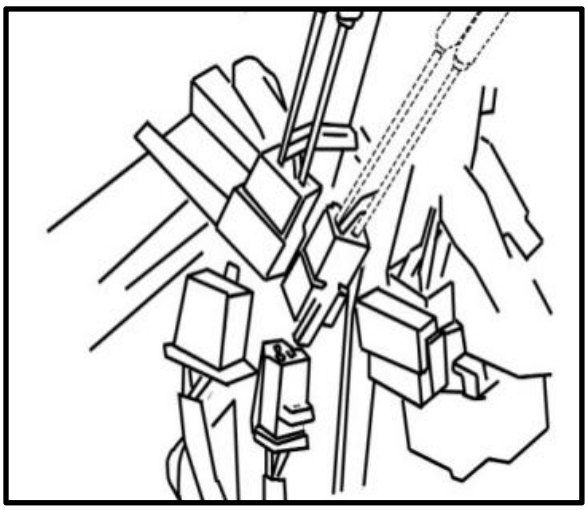
Main wire circuit inspection

Item (wire color)	Judgment
Check voltage between battery terminal (red) and ground (green).	Battery voltage
Check continuity between ground(green) and frame.	Continuity
Check illumination wire (yellow) to ground. (disconnect the connector of the resistor's pin and automatic by-starter pin. Illumination switch is in OFF)	Continuity & resistance
Check charging coil (white) to ground)	Continuity & resistance



If the measured value is abnormal, check the abnormal wire circuit. If components are good, it could be a poor wire circuit.

If all items are in good condition, then replace the voltage regulator.
If main wire circuit check is in normal and there is no loose in the pins of voltage regulator connector, then measure the resistance between the connector of voltage regulator.



Voltage Regulator Check
Unit: Ω If the resistance values are abnormal among the pins, replace the voltage regulator.

Regulator Check Unit: Ω

Red	yellow	yellow	yellow	red	green
yellow		/	/	/	4
yellow	/		/	/	5
yellow	/	/		/	5
red	5	5	5		12
green	/	/	/	/	

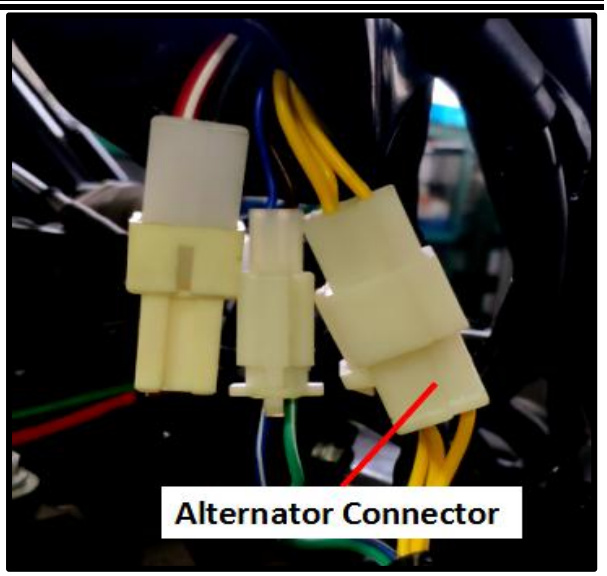
⚠ Caution

- Do not touch the probe of multi-meter by fingers, then the resistance values will be incorrect because there is some resistance existence in human body.
- To use the multi-meter recommended by SYM. Otherwise, the measured resistance might be different.

ALTERNATOR CHARGING COIL

Caution

The check of alternator charging coil and illumination coil can be done when the alternator is mounted on engine.

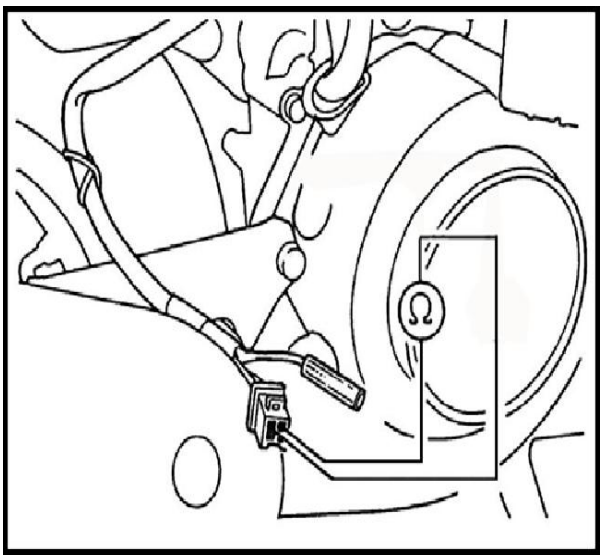


Check

Remove the 3P connector of the alternator. Measure the resistance between the white wire on yellow wire with a multi-meter.

Standard: 0.6±0.1Ω (20℃)

Replace the alternator charging coil if the measured value exceeds standard.



IGNITION COIL

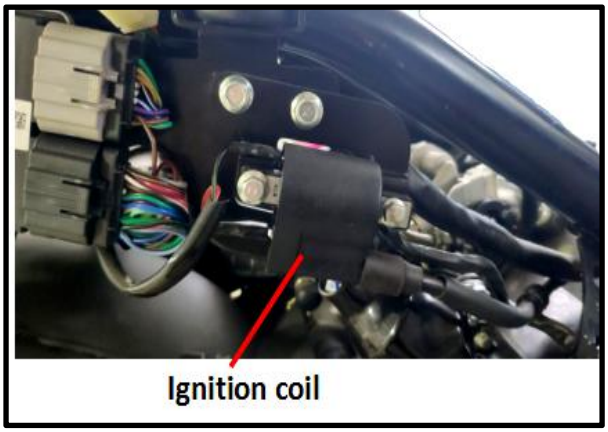
Removal

Remove the luggage box, center cover. Remove spark plug cap. Remove the primary coil wire of ignition coil. Remove the fix bolts for the ignition coil, and remove the ignition coil.

Install the ignition coil in reverse order of removal.

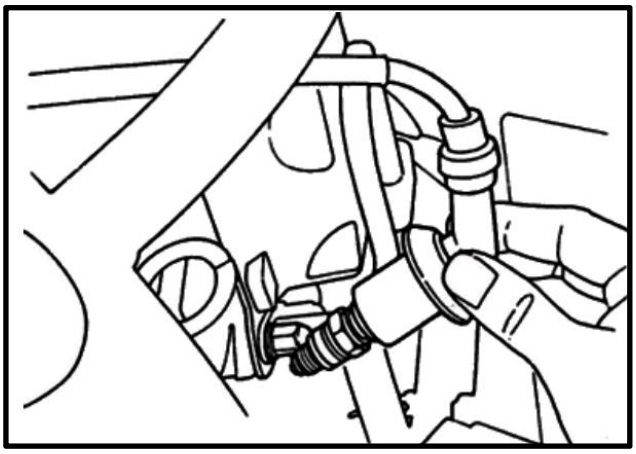
Caution

Install primary coil with black/yellow lead connected to black connector and green lead connected to green connector.



Spark plug confirmation

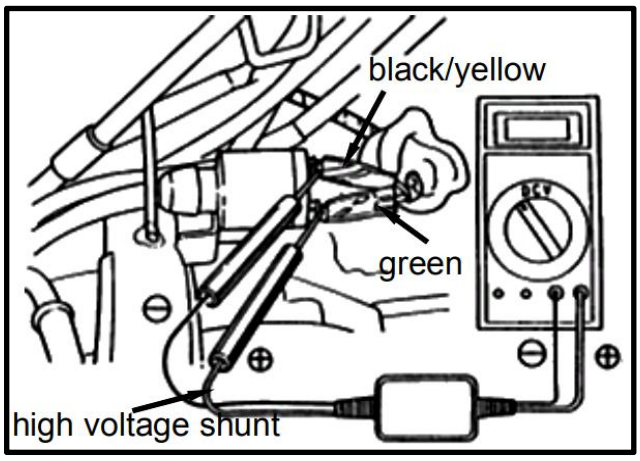
Remove the spark plug and install a good plug into plug cap, and then ground it to engine ground.
Make sure its spark condition. If it is in not good or burnt spark plug, replace the spark plug with new one.



⚠ Caution

- Make sure each wire connection is correct, and test as required. Even the wire connection is in correct, sometimes, it might not be tested occurred.

Connect the high voltage shunt with a multi-meter or input a resistor in the 10MΩ 100V of voltage meter.
Connect ignition coil wires, and connect a shunt between primary terminal (black/yellow and green) and frame ground.
Press the starting motor button, or starting lever to test the max. primary voltage of ignition coil.
Connection: connect (+) terminal to green side, and (-) to black/yellow side.

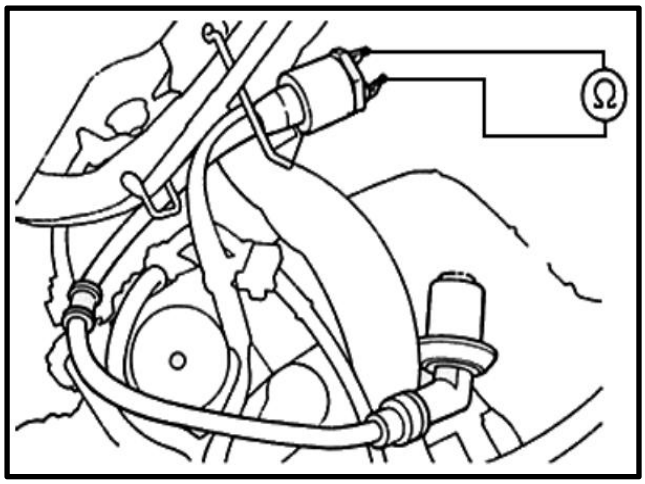


⚠ Caution

Do not touch metal parts on the test probe with fingers to avoid electric shock.

Min.voltage:Above95V.

Disconnect the primary coil connector and check the resistance between primary coil terminals.



Primary coil check
Standard: 0.21Ω ±10%Ω (at 20℃)
Primary coil is good if resistance within standard.
Primary coil is broken if resistance is infinite. Replace the coil.

Secondary coil

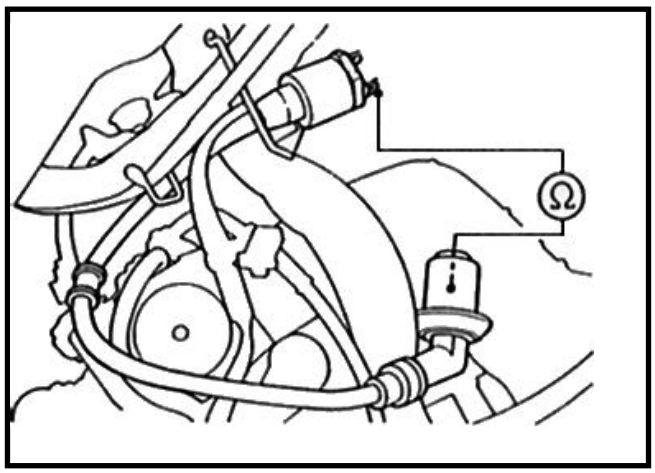
Attached the spark plug cap, measure the resistance between plug cap side and green terminal.

Standard value: 7-12 kΩ (20℃)

Remove the spark plug cap, measure the resistance between plug cap side and green terminal.

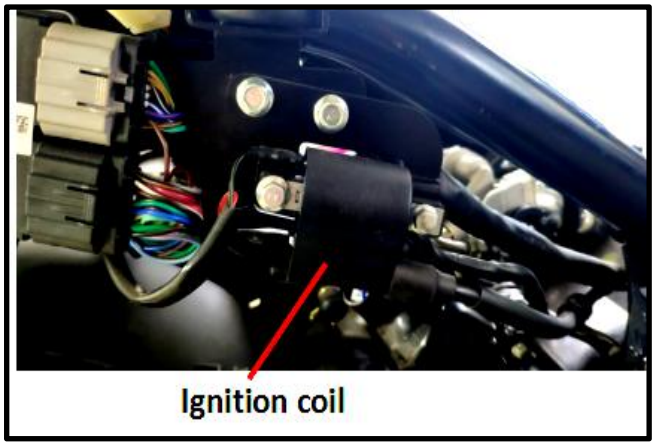
Standard value: 3-5 kΩ (20℃)

Secondary coil is good if resistance within standard.
Secondary coil is broken if resistance is infinite. If the spark plug cap attached and
the measured value is exceed standard value, it means the spark plug cap is in not good.



Replacement

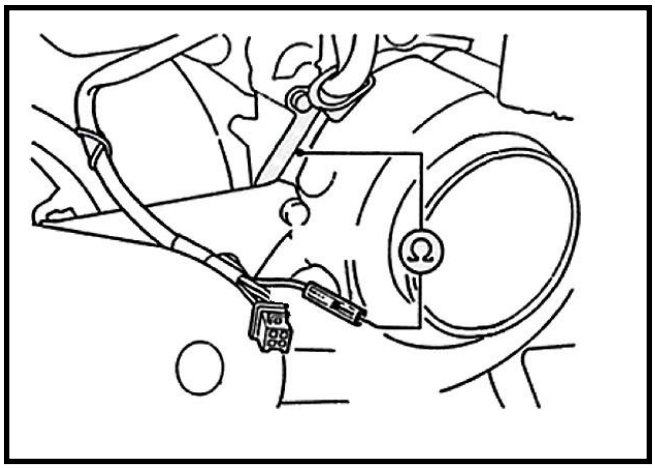
Remove the ignition coil bolt to replace the ignition coil if necessary.



PULSE GENERATOR

⚠ Caution

Checking pulse generator can be done on engine. But, the spark plug must be installed onto the cylinder head, and cylinder compression pressure must be in normal condition.



Check

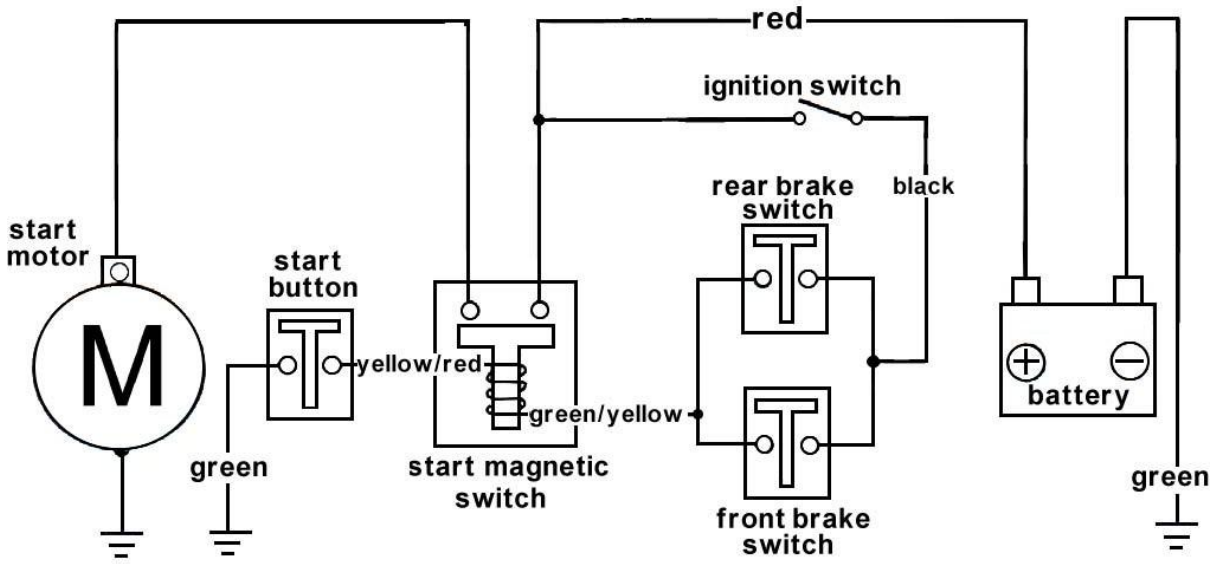
Remove body cover.
Remove the pulse generator connector. Measure the resistance between blue/yellow terminal on engine side and frame ground.

Standard: 140±20Ω (20℃)

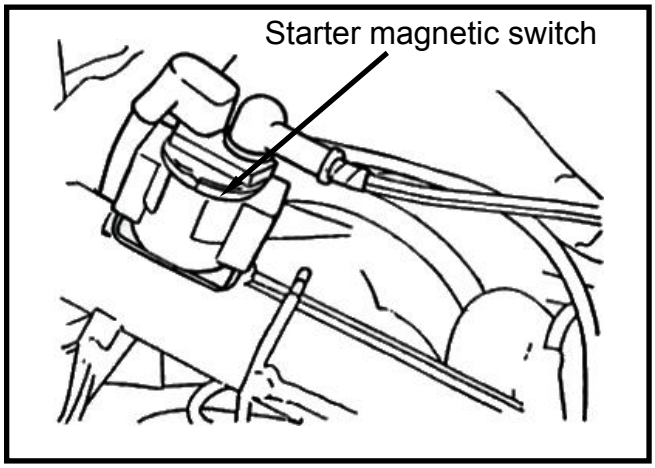
Replace the alternator if the measured value exceeds standard value.

STARTING SYSTEM

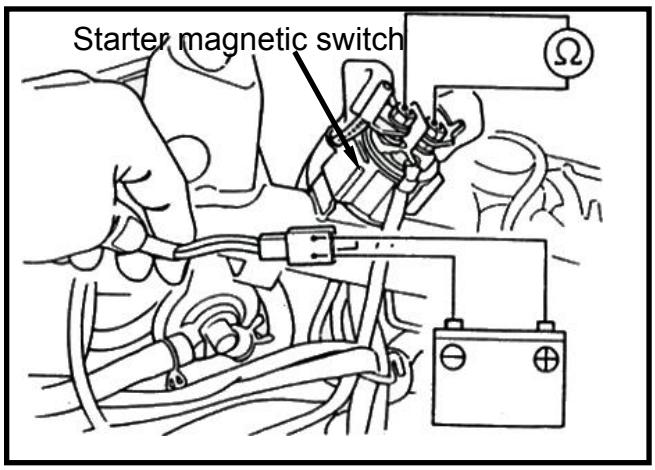
Starting Circuit



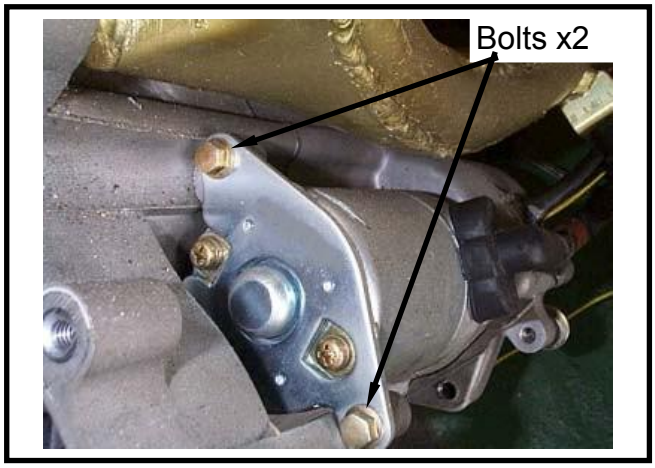
Starter magnetic switch inspection Turn main switch to "on", and operate the brake lever. Then press starting button to check if there a click sound. It is normal if there is a click sound.



Remove the luggage box.
Disconnect the battery negative (-) terminal. Remove the battery positive (+) connection and starting motor wires from the starter magnetic switch large pin.
Remove the power control connector of the Starter magnetic switch.
Connect a Ohmmeter between the Starter magnetic switch large pins.
Connect the green/yellow wire to battery positive (+) terminal, and yellow/red to battery negative (-) terminal.
Check the continuity between the Starter magnetic switch large pins. If it is not continuity, then replace the starter magnetic switch.



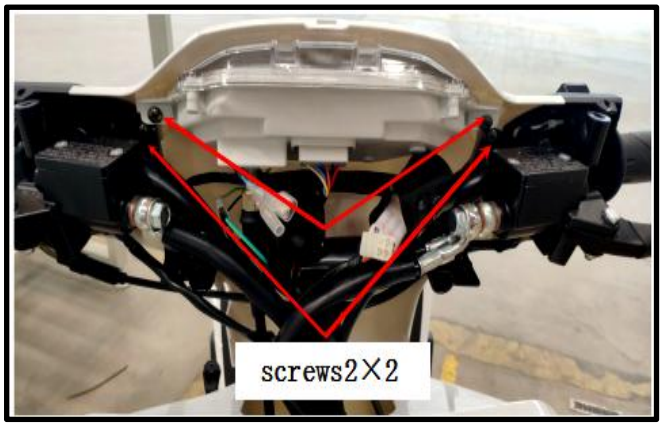
Starting Motor Removal
Remove the battery cover.
Firstly, remove the battery negative (-) terminal, and then remove the positive (+) terminal.
Remove the luggage box.
Remove the starting motor power wire. Remove the starting motor mounting bolts and motor.



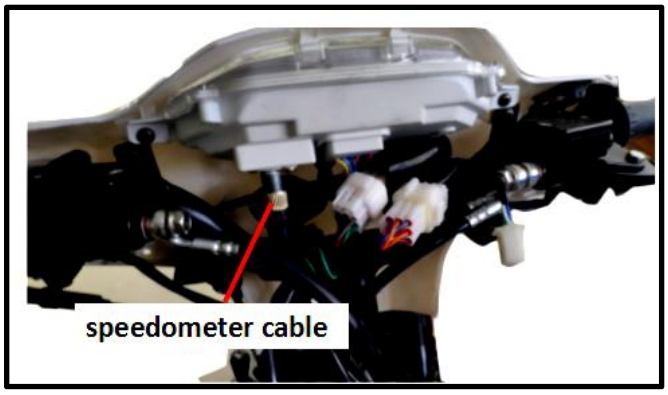
Starting Motor Installation
Install the motor in reverse order of removal.

METER

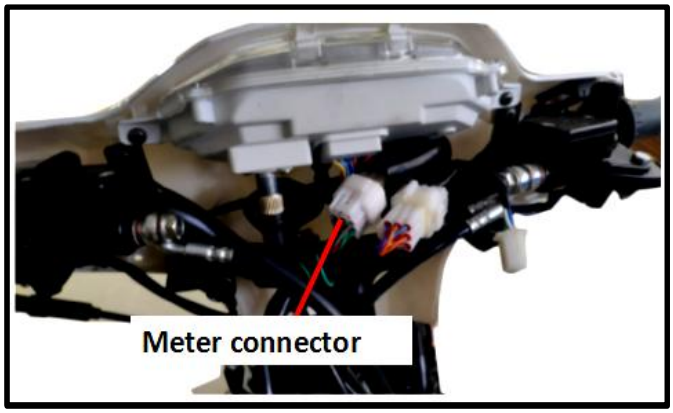
Removal
Remove the front handle cover.



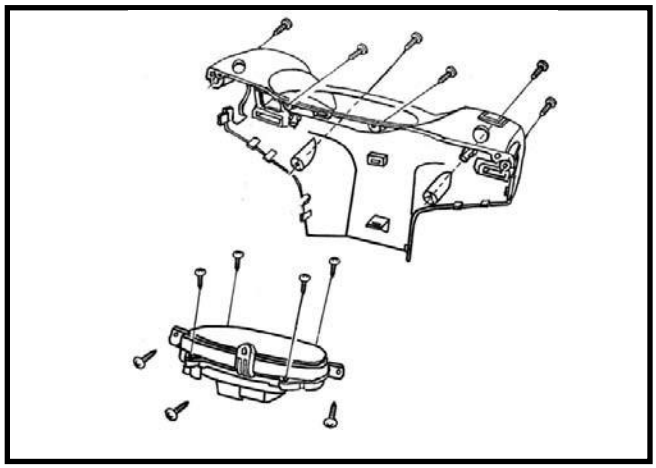
Remove the speedometer cable.



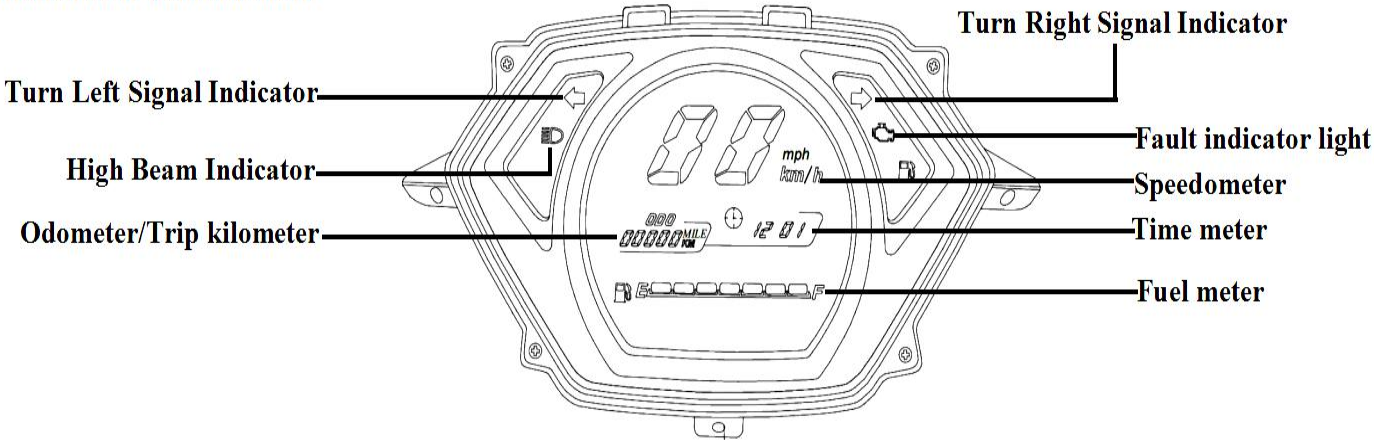
Remove the front cover.
Remove the power connector of the meter.



Remove the rear handle cover. Remove the meter mounting screws. Take out the meter.



Instrument combination



⚠ Caution

Do not wipe the meter or headlight with organic solvent such as gasoline to prevent from damage these components.

Installation

Install the meter in reverse order of removal.

HEAD LIGHT

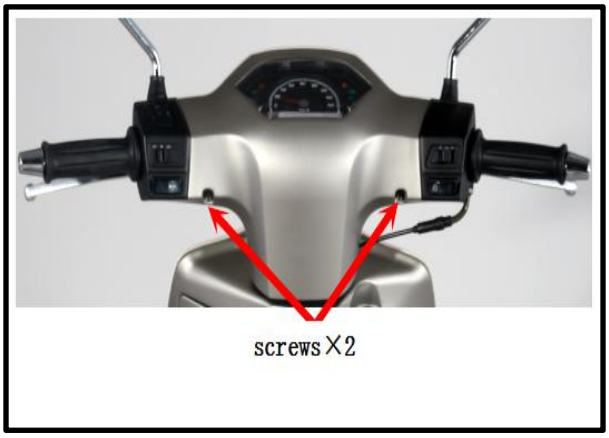
Headlight Replacement

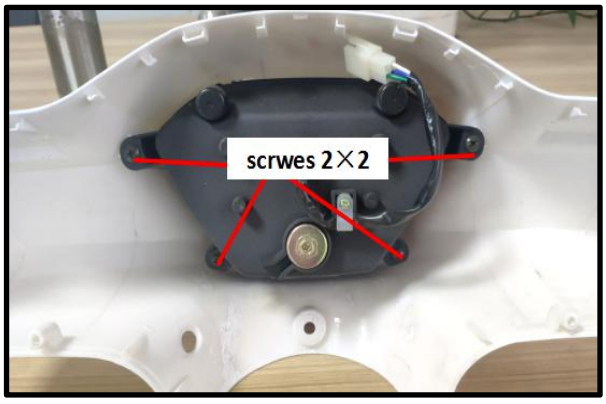
Rear the front handle cover.
Disconnect the headlight wire connector.

Install the head light in reverse order of removal. Turn the main switch ON/OFF to check if the light has been installed properly after installation.

⚠ Caution

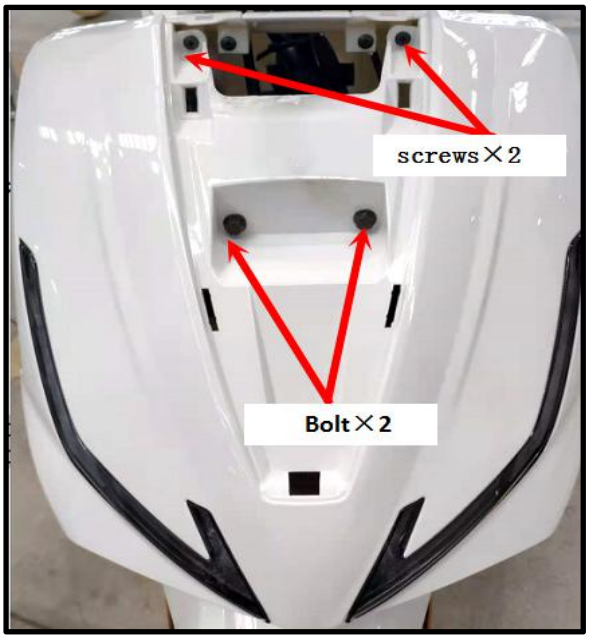
The headlight is led and cannot be replaced alone. If it is broken, please replace the whole headlight.





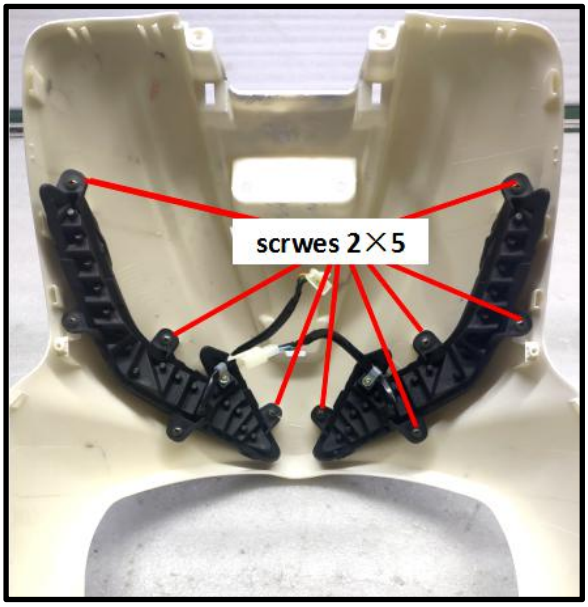
FRONT TURN SIGNAL

Replacement
Remove the front cover.
Remove the wire connector of the turn signal light.



⚠Caution

The headlight is led and cannot be replaced alone. If it is broken, please replace the whole headlight.

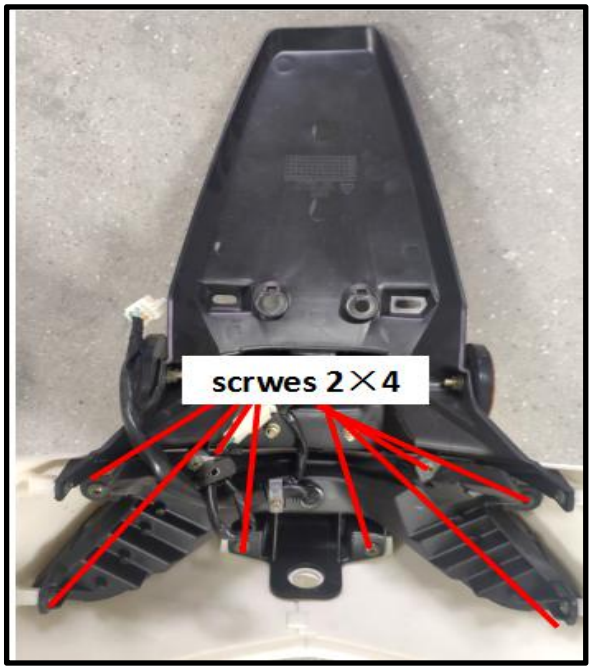


Installation
Install the turn signal light in reverse order of removal.

Replacement of tail light/brake light/rear turn signal light.

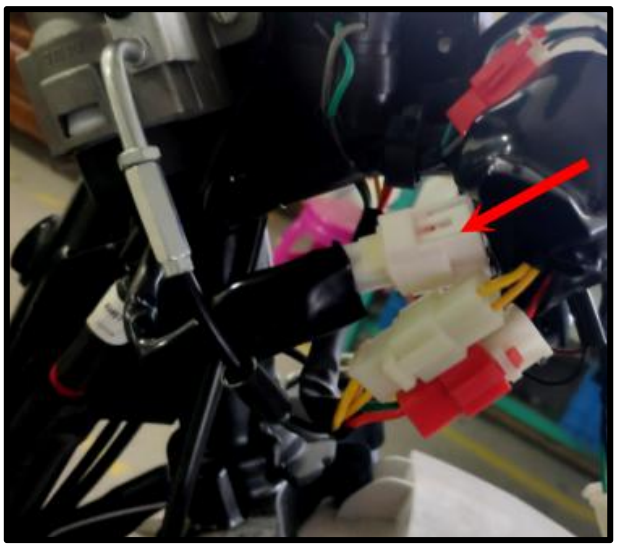
Remove the taillight &left/right turn light .

Remove the tail light assembly.



Installation
Install in reverse order of removal.

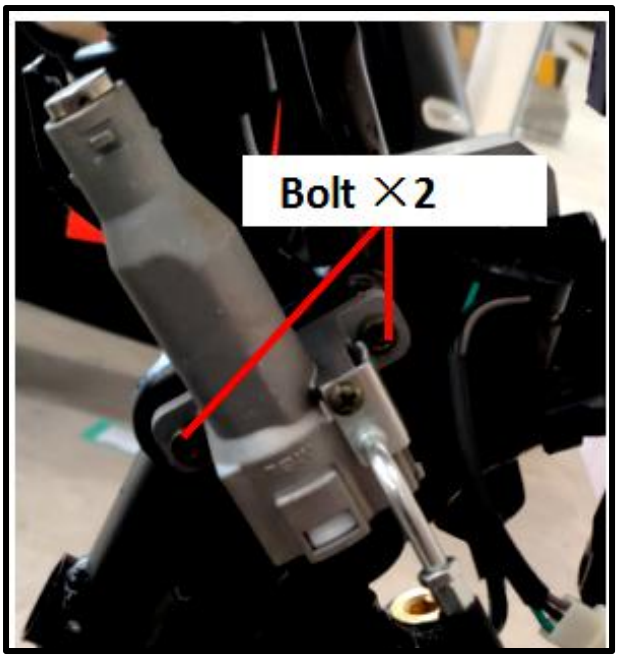
MAIN SWITCH/HORN



Main Swith Check

Remove the headlight connector and the front cover.
Disconnect main switch leads connector.
Check connector terminals for continuity.

color / Location	Black	Black/ white	Red
OFF	•		•
ON	•	—	•



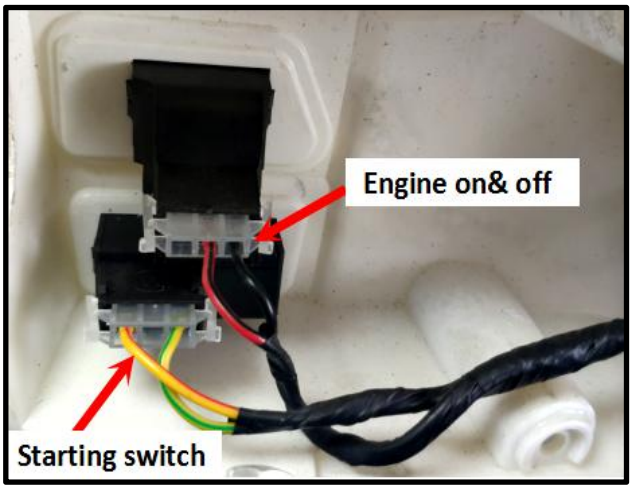
Replacement

Remove the main switch connector and fixing bolts (bolts x 2)
Remove the main switch.
Install a new main switch and tighten the bolts. (bolts x2)

HANDLE SWITCH

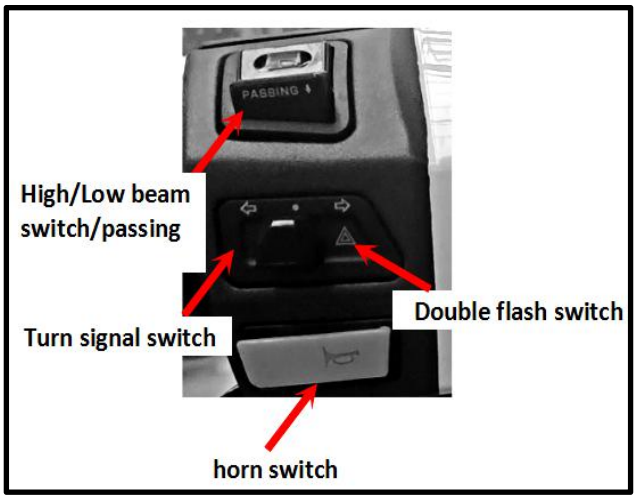
Remove the front handle cover.
Disconnect the connector of the handle switch. Check the continuity of follow pins listed below columns.

color / Location	Red/Black	Black
○		
⊗	●	●



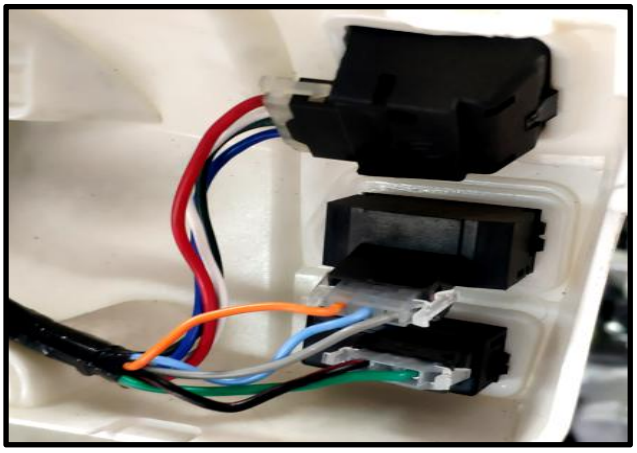
Starting switch

color / Location	Yellow/red	Yellow/green
FREE		
⚡	●	●



High/Low beam switch/passing

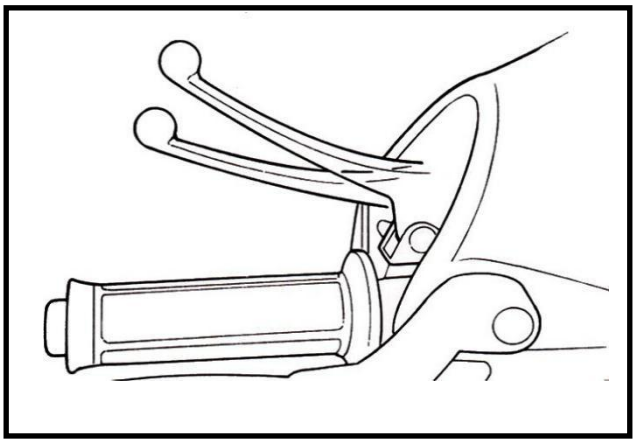
color / Location	blue	white	dark green	red
≡D	●		●	
≡D		●	●	
≡D	●			●



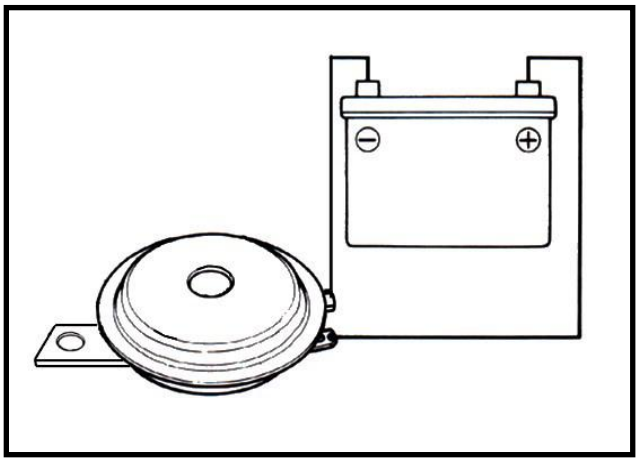
Horn switch

color / Location	brown/red	green/black
FREE		
📯	●	●

Brake light switch
The circuit of black wire and the green/yellow wire on the brake light switch should be in continuity when operating the brake lever.
If the switch damaged, replace it with new one.

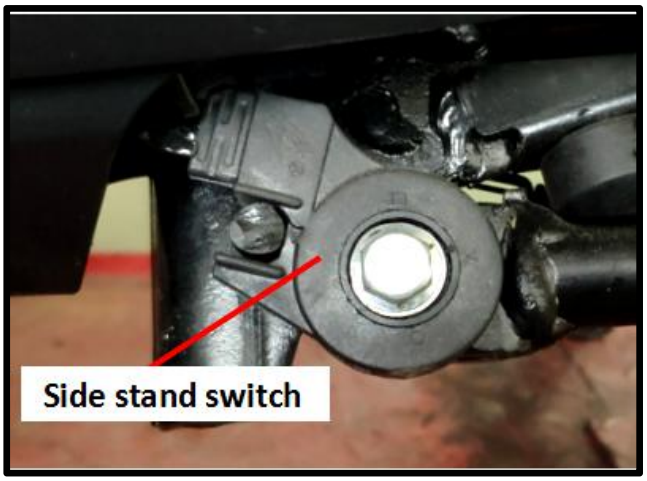


Horn
Remove the front cover.
Connect the light blue wire on the horn to the battery positive (+) terminal, and the green wire to the battery negative (-) terminal.
Then, the horn should sound. Replace it if necessary

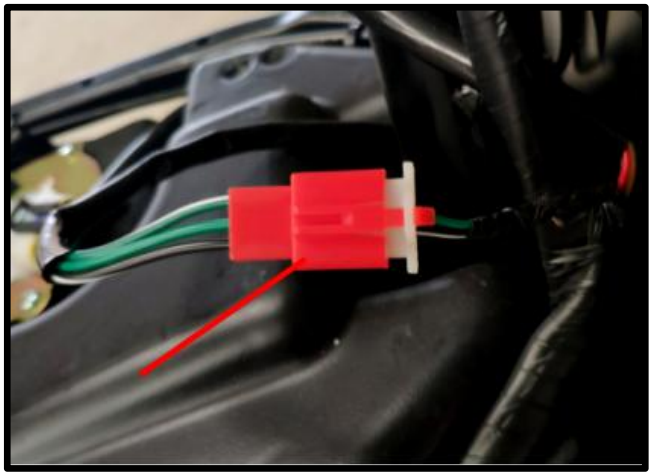


SIDE STAND SWITCH

Check connector terminals for continuity.
If the connection is normal, it needs to be replaced.



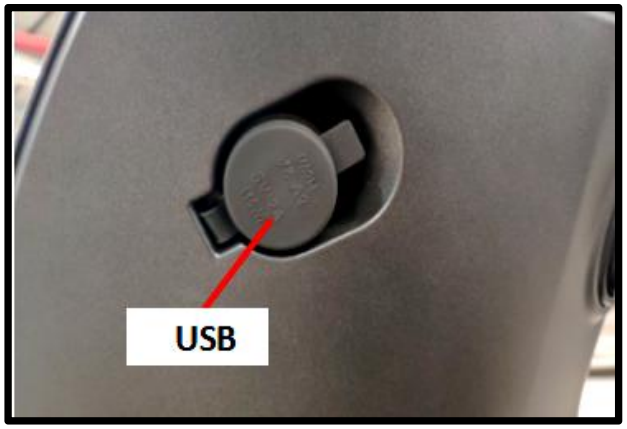
Replacement
Remove the side stand switch connector and fixing bolts (bolts x 1).
Remove the side stand switch
Install a new main switch and tighten the bolts.
(bolts x1)



16-19

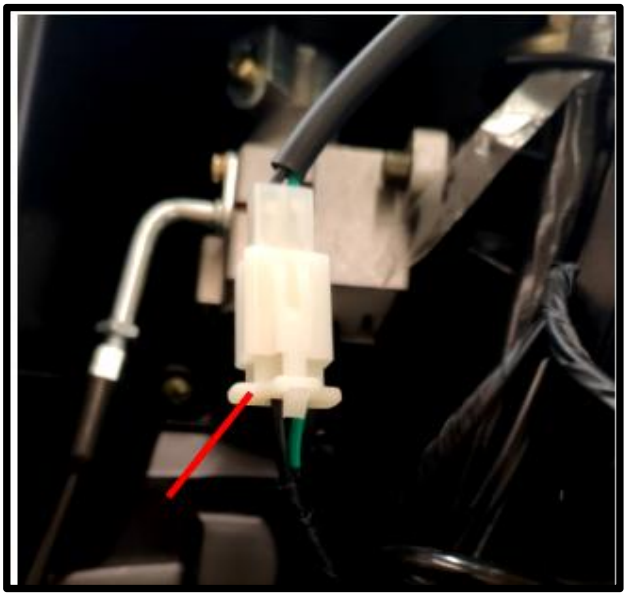
USB

(This motorcycle is equipped with USB interface
USB output voltage for DC5V can charge your mobile device).
Check connector terminals for continuity.
If the connection is normal, it needs to be replaced.



USB check

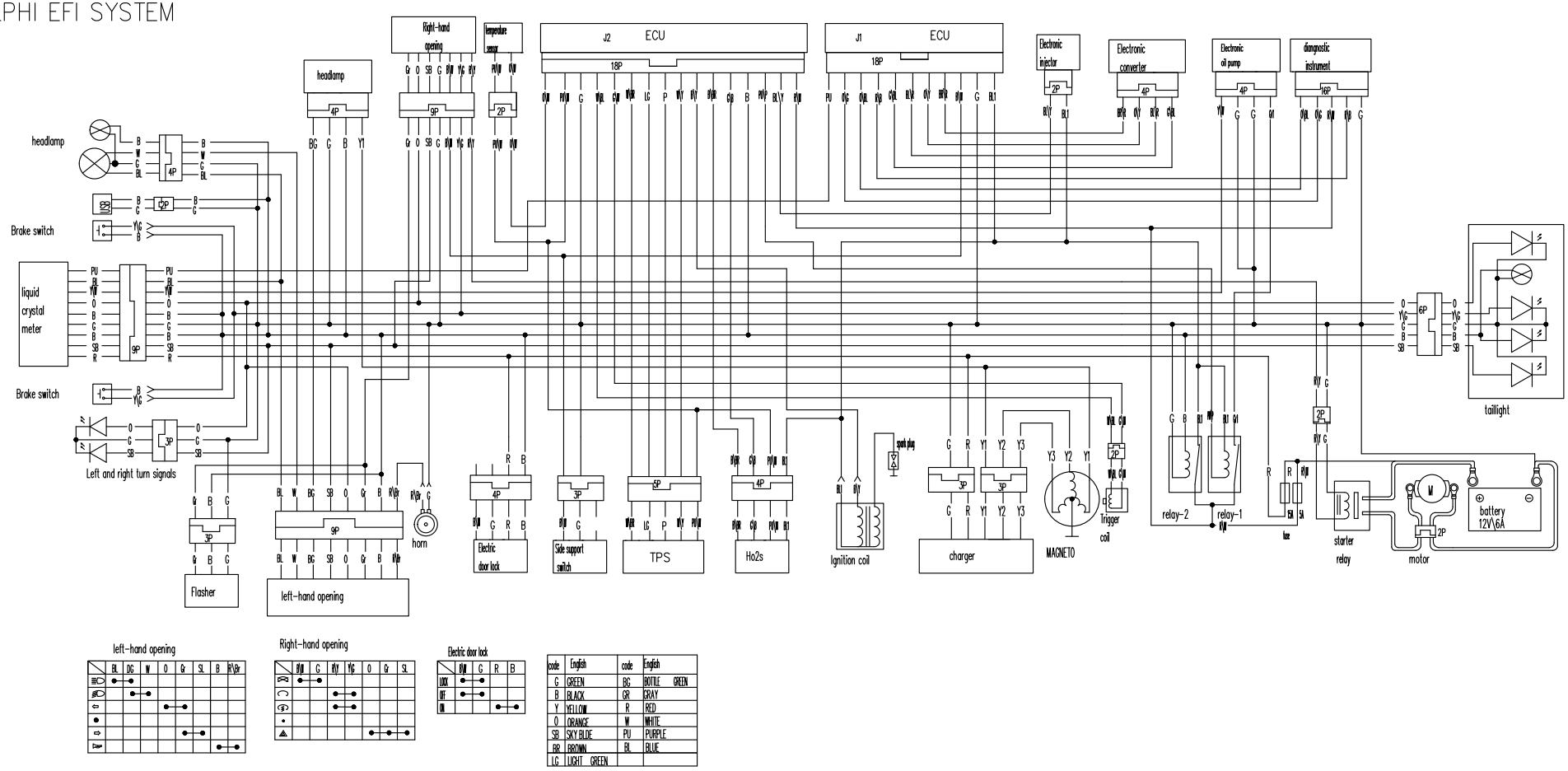
First turn on the power lock to measure
Black and green wires on the USB connector.Use the DC to measure the black line and the green Line voltage.
If the measured voltage is above 12V, then USB is damaged.



Replacement

Open the front cover, find the USB retaining nut and rotate it in the opposite direction.

DELPHI EFI SYSTEM



code	English	code	English
G	GREEN	BG	BOTTLE GREEN
B	BLACK	GR	GRAY
Y	YELLOW	R	RED
O	ORANGE	W	WHITE
SB	SKY BLUE	PU	PURPLE
BR	BROWN	BL	BLUE
LG	LIGHT GREEN